AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

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The Allen Governor.

The Allen Steam Engine Governor, illustrated upon this page, has achieved considerable success in controlling and regulating almost all kinds of link motion and variable cut-off steam-engines, including the Corliss, (to which it is specially adapted), and all other engines subject to great variations. It is claimed that every engine to which it is attached will run with the throttle wide open. To whatever changes in steam pressure, or changes, however sudden, in power used, the engine may be subjected, with this governor, it should not vary more than one revolution as long as there is sufficient steam to do the work.

This Governor is simple in construction, not liable to get out of order, permits the speed of the engine to be changed at will, is neat in appearance, noiseless, very durable, saves the engineer's time, saves fuel, and is powerful and sensitive in its operation.

The construction of Allen's Governor is as follows:

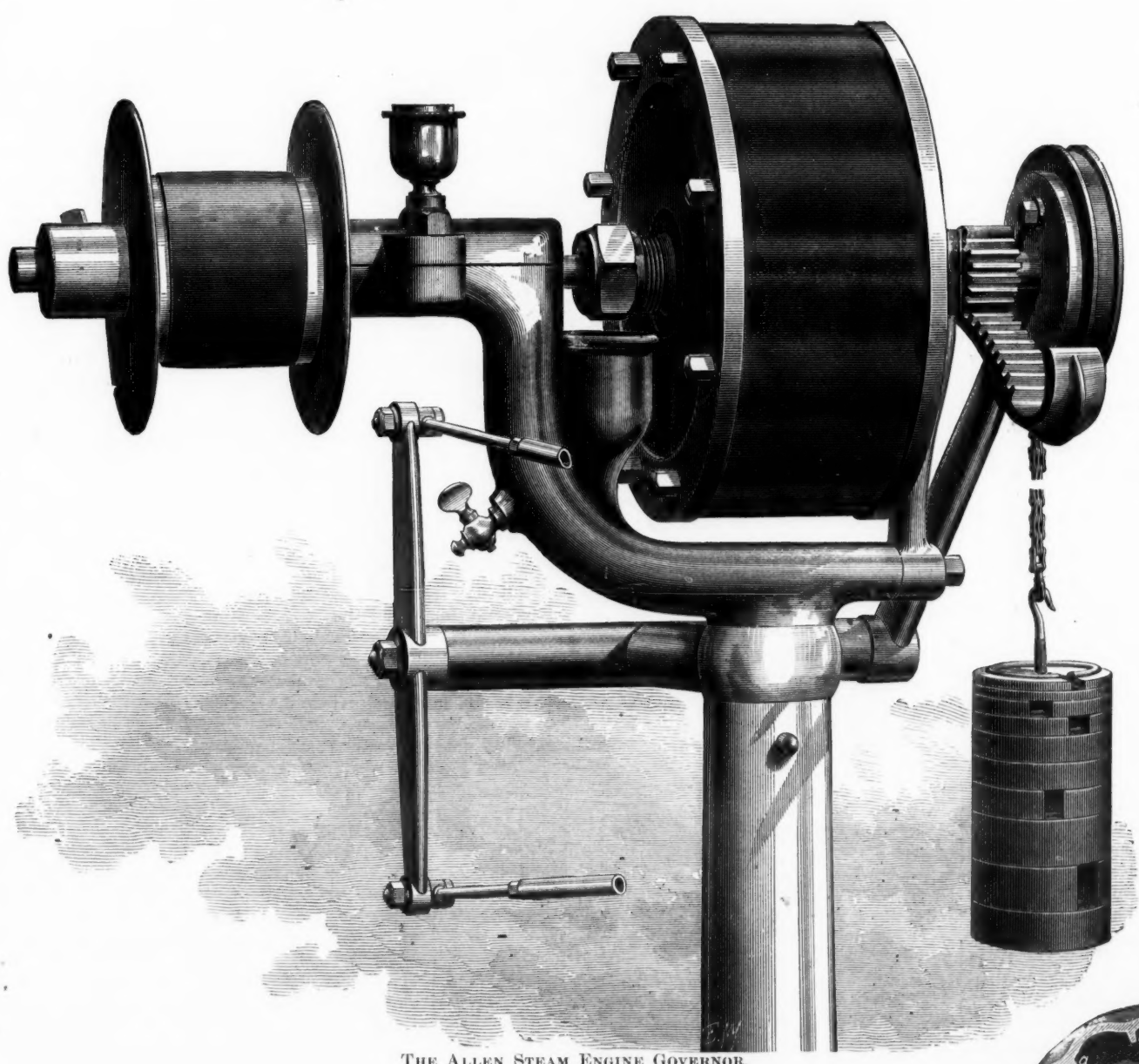
Within a corrugated cylinder, which has small projecting ribs on its interior periphery, and which is partially filled with oil, a paddle-wheel is caused to revolve by a spindle passing through one end of the cylinder, driven by a belt communicating with the fly-wheel shaft. The tendency of the revolving paddle-wheel is to cause the cylinder to move in the same direction. On the opposite side to the revolving spindle is a trunnion or short spindle fixed to the cylinder, attached to which is a wheel carrying a set of movable weights suspended by a chain, the speed of the engine being regulated by the number of weights. Attached to the wheel and keyed on the end of the short spindle is a pinion revolving with the cylinder, and working in a toothed sector, the arm of which, being fixed on the spindle of the throttle-valve, opens or closes it as the oil cylinder moves with the paddle, according to the variation of load thrown on the engine. When used with a variable cut-off engine, the arm is attached direct to the cut-off.

It will be seen that the weights are raised and lowered in a nearly vertical line, and, unlike those of some other governors, remain the same at every point of their suspension. The high rate of speed used acts advantageously in making the Governor very sensitive; and, all parts being lubricated, it works with the smallest amount of friction. The centrifugal or ball principle being entirely abandoned, the movable weights are suspended as easily at one point as at another, by the action of the paddle-wheel in the oil cylinder.

The peculiar action of this governor, which enables the use of a valve of large area, thereby admitting to the engine cylinder the greatest possible boiler pressure at each stroke of the piston, has produced excellent results by being attached to old engines. In running an engine with this governor, with high or low pressure of steam and with all variations of power, the throttle is opened wide in the morning and remains so until closed at night, thus relieving the engineer from all labor and care, except keeping the engine oiled, and giving him a great deal of time for other duties.

Allen's governor valve is constructed with a double disc in a tubular form, and is perfectly balanced, there being no spindle, as in the ordinary throttle valve, to interfere with its equilibrium. The valve is moved by means of a lever, and is opened and closed by a rocking motion of a steel spindle, which is covered with brass, ensuring the greatest possible durability. The Allen Governor Co., B. W. Spence, Treasurer, Boston, Mass., manufacture this valuable adjunct to the steam engine.

Fig. 1



THE ALLEN STEAM ENGINE GOVERNOR.

The wages of the employees of the New York & Long Branch Railroad and the New Jersey Southern Railroad, both operated by the Central Railroad of New Jersey, were increased on April 1st. The men receiving $50 or less a month will obtain an advance of 20 per cent., and those receiving over that amount 10 per cent.

The French Society for the encouragement of national industries offers a prize of 1000f. for the best essay on the tools employed in America in the manufacture of watches.

The Maine Beet-Sugar Company last year worked up 9,000 tons of beets, and produced 900 tons of sugar and molasses. The total outlay reached $107,000, and the receipts (not including State bounty) were $110,000.

Extracts from Chordal's Letters.

Mr. Editor:

* * * * I am half convinced that some manufacturers look upon the ill-will, or dissatisfaction rather, of a customer as simply a matter of annoyance. If Wyckoff sells half a dozen nail machines to Woods, and the machines don't act just right, Mr. Wyckoff will be pretty apt to hear from Mr. Woods. He will keep on hearing from him, and notwithstanding the fact that he has got his money for them, he will finally fix the machines up and make them work right. He don't do it because he has any particular interest in the nail machines, but simply because Woods won't let him alone till the machines do act right. Wyckoff don't seem to say to himself: "Now, here goes half a dozen nail machines. If they give good satisfaction, I will sell lots more of them, and if they don't I won't."

Apparently the only view he takes of the thing is to fill the order and wait for the next thing to come along.

It seems to me there is something more than this in such transactions. It don't pay in the machine business to wait too long for the next thing to come. A certain amount of force must be put into the thing, and it strikes me that the satisfactory operation of something already delivered is sure to result in future orders.

Of course most manufacturers act on this principle, but Wyckoff don't. I

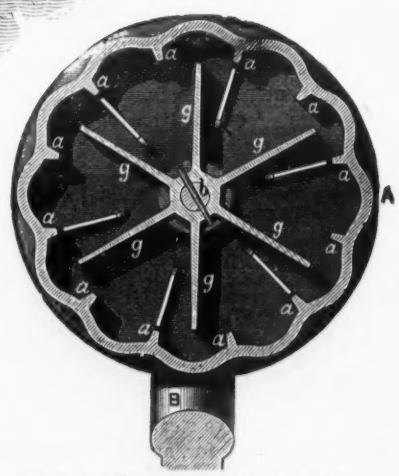


FIG. 2.—SECTION OF GOVERNOR.

know some manufacturers who look entirely to the satisfaction of customers, and give no thought to the real merit of the product. This may look unreasonable, but merit will not always insure satisfaction. The notion of a large class, the habits or customs of a section, the ignorance of the mass, the conservatism of a class, the prestige of some old and played out plan, all these things have a bearing on the question of satisfaction while they all may be directly against merit.

* * * * Many machinists in small places who decide on building engines, make the grand mistake of building "My style of an engine," instead of the style the customers will take to. The up-hill business of fighting prejudice don't pay unless the reward is greater than such things generally promise.

* * * * Some years ago an engine bed was a box with everything bolted to its top. Any fault in such engines was not due to the form of the bed. The looks was a matter of taste, and strength could be secured by putting in a few more tons of metal. But Mr. Corliss in constructing his new engine many years ago wanted one side of the cylinder clear, and instead of setting the cylinder a foot higher than usual he bolted it against the side of his bed, which was still of box form.

This arrangement brought the guides at the side also, and it brought the pillow-block in the center line of the box. Aside from the location of the pillow-block, the arrangement looked much like a common box-bed engine rolled over on its side with the shaft thrown back again. Soon he discarded the box form and used a vertical web with a heavy skewback brace on its back. Then he wanted both sides of the cylinder clear and got it by casting a flange on the bed, to serve as the front cylinder head. Next he cast the guides on the bed, and finally developed the girder-bed engine. Here was found something new. The bed was very stiff, the parts could not get out of line, they were easily accessible, and the bed was much lighter than usual, which showed that the metal had been put, or had got into the right place. Besides these virtues the engine was cheaper so far as the bed was concerned. When the bed was done it was found that the guides were done, the pillow-block was done, and the front cylinder head was done.

* * * * In course of time other engine builders began to see that the virtues of the girder bed were applicable to any engine. The thing grew, and it is safe to say that eight out of ten of the prominent engine builders of the world have adopted the girder type of bed, no matter what the form of cylinder.

* * * * The alleged merits of the girder bed have lately been questioned in the columns of the American Machinist, and some discussion has followed. I don't propose to go into the discussion at all, but as being pertinent to the present subject, I simply call attention to the facts, viz: that the majority of the most skilled engineers and constructors have adopted the girder form of bed, and the most intelligent and critical customers have approved it. In short, whether worthy of it or not, the change from box bed to girder bed has been taken by the world as one of the gauges of progression in design.

* * * * Now for the application. The man who changes from box to girder is called progressive, and the man who sticks to the box is called old fogyish. How does the world know he is a fogy? Who knows what form of engine the fogy likes best? He may possibly despise a box bed and build nothing else. I know of sections in this country where you could not make the people believe the thing was a steam engine at all if it didn't have the old style of bed. In the face of such conditions is the good business man to pander to his own tastes and sell three engines a year, or to the tastes, depraved as they may be, of his customers, and sell a hundred?

* * * * No man living can explain what an expensive steam dome is put on a locomotive boiler for, and no sensible man will rush into a domey country and try to make his everlasting fortune selling domeless boilers.

* * * * The whole steam space of a boiler forms an elastic cushion for a feed pump to work against, and the average air chamber don't form an elastic cushion as alleged. Still, who would dare to leave the air chamber off of a feed pump?

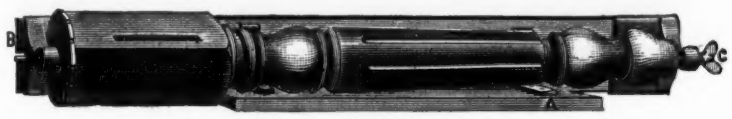
* * * * There are about two thousand different ways of adjusting crank brasses in connecting rods, and probably the very worst in the lot is the common key found universally in this country. In England, the T headed rod with bolts is the thing. In Germany and France, the inside and invisible wedge adjusted by a screw is found. Who would be unwise enough to go in the popular market in this country with an engine that didn't have keys in the connecting rod? The people understand this key business; they drive them down hard, and then slack them out and let them fall back with their own weight. This is habit; they can't do it with anything else, and don't want to learn new tricks, and don't want too much to do with things which their old tricks won't fit.

* * * * A common pipe heater on a four horse-power engine, will save four dollars and a half a year in fuel, if coal costs enough and the heater works theoretically perfect. It costs six dollars a year to keep the heater pipes clean and in repair. No sensible man would try to sell a portable engine of any size, in this country without a heater.

* * * * Probably the very worst form of piston packing which can be put into an engine whose repair, etc., depends entirely on the engineer, is the common three-ring packing with springs and jack-screws inside. Such packing can do little harm in locomotive work, where the engineer can see the shop every eight hours, if required, and where a man specially skilled in the art is detailed to set this packing. It is not certain that there is not better packing, even for locomotive work. For portable engines, a solid piston, without a shadow of a ring, or spring, or screw, would be far superior to the packing which is and must be put in before the engine will give satisfaction.

* * * * We are not very conservative in this country, but still there is such a thing as a device being born too soon. The people won't have it, and a wise manufacturer sometimes lets it alone. The brilliant and radical inventor will sometimes find his offspring entirely too perfect for the time. Its very perfection of adaptation implies, probably, a radical departure from well understood plans, and, too often, as a consequence, the very perfection of adaptation to function involves a perfect inadaptation to common surroundings.

* * * * If there was ever a short cut made all of a sudden, it was when the direct acting steam pump was invented. As far as my knowledge goes, Mr. Worthington is the real inventor of this radical contrivance.



Fluting Attachment.

He found steam moving a piston in a straight line; he found pistons moving water in a straight line. The cause was as he found it; the result was as he desired it. But what a world of complicated, intermediate machinery he found between these simple terminal elements. He straightened the matter out, discarded the entire intervention, and produced a machine which consisted of a single transmitting piece of metal, moving in the simple and identical lines of inevitable force and required work.

* * * * All this was many years ago—in 1840. During the intervening years the steam pump has, without any real material change in structure, found its true place in the busy world and in the appreciation of users, but every day since its birth has been an up hill struggle for recognition, owing to the simple fact that the new pump was not enough like the old pumps.

* * * * Mr. Worthington, in giving some notes on the growth of this important invention gives us the voice of men who were years ago the highest powers in the mechanical world.

At that time Mr. James P. Allaire, of the Allaire works, represented the height of progress. Mr. Worthington says: "He, Mr. Allaire, nearly reduced me to hopeless inaction, by saying that he considered it his duty to tell me that I was trying to invent a machine that was not wanted; that no part of the machinery of either for steamboat or factory purposes, was more satisfactory and complete than that for pumping. And this seemed to be the opinion of almost every engineer. Another opinion expressed by a prominent engineer of the day, Mr. Alfred Stillman, of the Novelty Works, was sufficiently discouraging at the time, yet of great value, as compelling me to look still further. He came to my works one day to inspect the last and best arrangement of piston throw valve. After a careful and quiet consideration of the case for a few minutes he said: This is all very well and very ingenious, but if you expect to bring these things into general use, you must contrive to have a man see something he has seen before in his life when he takes the cover off from a steam chest."

* * * * Mr. Worthington states that with this and similar opinions as a cue, Mr. Baker and himself proceeded to discard, in a measure, a thing found too perfect but *de trop*, and to contrive something common enough to be acceptable. They succeeded, and a healthy growth began.

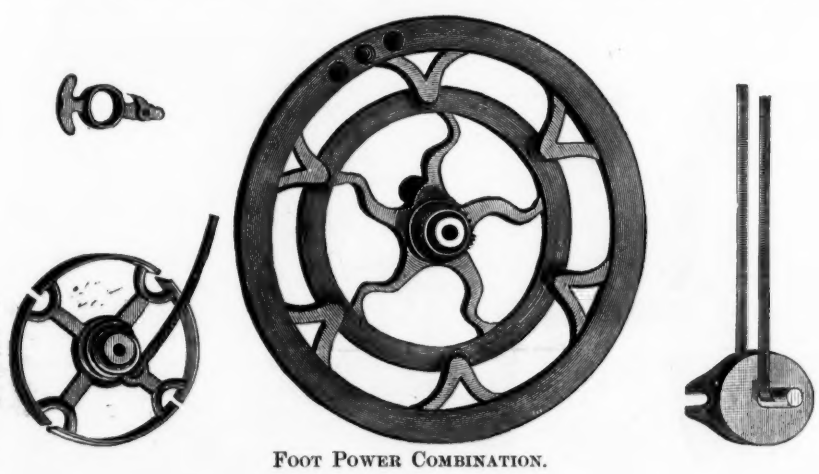
* * * * The present value of the steam pump as distinguished from ancient donkey pumps is too great to calculate, but it required fourteen new generations of steam users to provide it with any reasonable welcome. Mr. Worthington might have saved himself a world of trouble and mental anguish by not inventing a direct acting steam pump at all.

In later years, after the struggling infant has forced its way into popular use, hundreds of wise men see a good business in steam pumps.

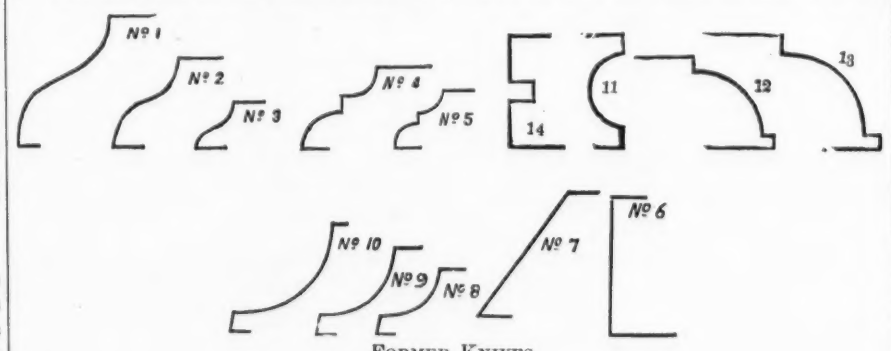
I will venture the opinion that if Mr. Worthington had it all to do over again, he would commence at the other end.

* * * * Yours respectfully,

Chordal.



Foot Power Combination.



Former Knives.

Foot Power Forming Machine and Attachments.

On this page and the one opposite, we illustrate a foot power combination, a foot power former, and the knives and fluting attachment belonging to the latter, which possess some novel and valuable features. The parts of the foot power combination are shown detached, also in the machine itself. The large wheel is the only continuously revolving wheel. The other oscillates about once around, and is termed a "take up" wheel. An oscillating thimble is used with two straps, which wind on and off by the action of the treadle-spring and wheel. A dog connects motion from thimble to the wheel.

In operation, the thimble is caused to oscillate by the two straps winding on and off. One is attached to the treadle, the other to the small wheel. This wheel is acted upon by the treadle-spring, which re-winds it, and thus causes the treadle-strap to re-wind upon thimble. The thimble carries the dog back and forth, which engages in large wheel in its forward motion, and without checking its speed, runs back idle for a fresh hold. By this simple arrangement, and with the effort of an ordinary walk, the large wheel can be driven at the rate of from 800 to 1200 revolutions per minute.

The foot power former represented on the opposite page is designed for moulding edges of brackets, scroll work, panel work, regular and irregular, mouldings of all styles up to $\frac{7}{8}$ of an inch. The speed of the knives is from forty to forty-five hundred revolutions per minute. The "velocipede foot power" is used with the combination above described. By means of this arrangement (the operation of which will be readily seen by reference to the cut), the knives are, at the will of the operator, caused to rotate in either direction that the grain of the wood may require, thus avoiding all complicated devices for reversing motion usually employed on single spindle formers. The great speed of the knives insures rapid and smooth work. Articles that look very plain can be made elegant and costly in appearance by the rapid and accurate work of this machine. Knives are furnished for the machine with edges like those shown in the cut.

The fluting attachment is used for fluting table legs and like objects. A, shows the edge of the pattern, the shape of which regulates the cut on the leg lengthwise.

The index-plate is spaced to make several divisions of a circle, and is regulated by the

snap-latch at B. C, is a screw-center with which the leg is fastened to place.

This attachment has all the adjustments necessary to work legs of usual length, and up to 3 inches in diameter.

This machine, with its attachment, is made by W. F. and John Barnes, Rockford, Ill.

Bits of Experience.

No. IV.

BY PROF. JOHN E. SWEET.

Mr. Chordal expressed himself some months ago as a little anxious to know what to do with his boy Joe. Now I propose to give Chordal some advice; of course, a young man giving an old one advice is a reversal of the usual order of things, but I am going to give it all the same. I know Joe first-rate. I have had him under me some years as a student. I have had him work under me and I expect to work under him yet. In fact I have had a good many of him, and my advice is: "Don't send him to college and then into the shop; don't send him into the shop and then to college. *Don't send him!* If he wants to go to college and you can afford it, let him go; if he wants to go into the shop, let him: in either case he will come out all right, and don't you forget it. I have known several of him that worked in the shop, and never went to college at all, who are worth ten each of some of those who did go. I have had him when he had been through his apprenticeship and then came to college, and have watched him after he left it for the shop. George M. set forth his original Joe's experience all right; but the Joe who first learned the trade and then went to college met with some humiliating draw backs that he likely forgot to tell of when he got home. He came to college with pretty definite ideas, but on entering the course he found that what he thought he wanted was but a small part of the studies laid down, while many things he wanted were not in the course at all. He wrestled with the entrance examinations; but the Geography he was master of four or five years before was out of date, the fashion in Grammar had changed, the test questions given in Algebra were not in his old one, and so he only sidled in with a condition or two hanging over his head. A large proportion of his class were fresh from the High School. They were used to learning, used to studying, and simply immense on passing examinations–not because they knew so very much but because they had learned the trade. Joe has to learn every thing he passes over. He is worth a dozen of the others as a prospective mechanical engineer, but some way the great gauge (the examination) gets him bad. The other fellows blow up their retentive mental bladders, pass through with flying colors, get their names on the Registrar's book—knowing as little of some of the subjects a week after the examinations as they did before, but poor Joe just gets through. Joe's natural disposition to stick to a thing when he once gets started holds him to his work, though he at times is dissatisfied; the whole course seems to him altogether too ornamental. In his free-hand drawing instruction he gets wall paper and carpet ornaments instead of the outlines of machine framing. In French the lessons are drawn from novels and plays instead of technical works. In Mathematics the problems so run on the broad gauge of mental discipline that poor Joe when he has to wrestle with the following question: "*Given a spool of thread of a certain size and weight, unwind 3 feet of the thread and hold it in a vertical position, then jerk up on the thread at a given velocity, and how far will the spool be drawn from the floor; the thread unwinding at the same time?*" bolts, while his class-mates figure the thing out. If they do not get within 16 feet of what the spool would do, no matter, they apply the rules and work the problem and receive a high mark. Joe, who could always figure out whatever he wanted to know, or will ever be likely to want to know, and nine-tenths of it in his head, got the spool and thread and proved that it was utterly impossible to do any thing of the sort as shown by the figures, and so got marked zero for his trouble.

In his rhetoric Julius Cæsar and the Fall of Rome serve as essay subjects in the place of Watt and the Growth of the Steam Engine. His mechanical drawing lessons are but copies from books instead of drawings of things, and so in all of his first years, Joe's practical experience, or practical common sense, leads him to battle with the decree which he can not remedy or hardly endure.

Some of the Joes quit, and others finding some things they do like, endure what they do not for the sake of getting that which they do and thus stay on. One of the Joes makes the acquaintance of a Professor, finds him a genial man and ventures to question if some other way of teaching a certain subject would not be an improvement, and is met with the unanswerable argument: "Do you suppose you know any more about this thing than I do?" Joe got acquainted with another Professor, and wondered if (as the class in a certain kind of mathematics had to be divided into three sections) it was not possible to divide the class so as to give them problems nearer related to the business they proposed to follow; that was to give the students in mechanics mechanical problems, those in architecture problems applicable to their business, &c., and the Professor very readily pointed out the difficulty—It would require a vast deal more work on the part of the Professor. Joe thought from 3 to 5 hours a day for 5 days in the week and only 35 or 40 weeks in the year quite mild over work, but then poor Joe had not the true conception of the mental strain of brain work, besides he did not see the force of the argument in the fact that the Professor was doing twice as much as some of the others were. Joe's practical ideas were constantly getting him into trouble. He could not understand that the college training is for culture, and not for use. But Joe's experience was but the experience of one class. Sackett's son, Alphonso, Wycoff's boy, Bill, and Jimmie C., as he was called, were fair representatives of other classes. Sackett's son was one of the students who went heavy on his father's wealth. He was one of the young men sent to college. Had his choice of where he should go; looked over the boating chances, &c., and selected the Courtnay Institute. Took to mechanic arts because the other boys from Burr did, and amounted to nothing when he came and was no better when he went away.

Bill Wycoff, of the plodding sort, had lots of theory rubbed into him and really profited more by his four years college life than any of the rest. He never would have amounted to much without his college training, but will now with it. Jimmie C. was started on the wrong road, a splendid little fellow. His father a successful engineer, but always jealous because he did not know every thing, was constantly lamenting his lack of education and, was anxious to have his son educated to the profession. But the trouble was, Jimmie, though a nice boy and a smart fellow, was not a bit of a mechanic. His father who ought to have known this but did not, and the Professors who did had not enough respect or not enough courage to tell him; and so, Mr. Chordal, if you have a son and have already sent him to college, and you are not sure mechanics are his forte, ask some of his instructors, and then make a liberal allowance for his Professor's respect for yourself.

NEW FOOT POWER FORMER.—SEE PAGE 2.

The following table shows the exports in tons of iron and steel from Great Britain to the United States for the first two months of the last three years.

	1878	1879	1880
Pig iron	3,580	6,363	126,221
Old iron	220	567	54,501
Steel, unwrought	798	775	5,550
Tin plates	15,722	18,132	27,270
Hoops and sheets	89	89	9,942
Bar, angle, bolt, and rod	1,122	191	13,345
Iron and steel rails	3	812	28,169
Total	21,534	26,929	264,998

About 75 of the soft-iron moulders at the Michigan Car-Works, Detroit, struck for an advance of 20 per cent. in their wages. The company offered 10 per cent. in addition to 10 per cent. added in November last, but refused to accede to the further demand.

Getting the Right Start.

BY F. F. HEMENWAY.

The machinist who has arrived at years of discretion and some little usefulness in his vocation, has undoubtedly learned that there are only two ways to do a job, viz.: a right way and a wrong way. If the boy about to work up to the mysteries of the craft, through an apprenticeship, thoroughly appreciates this fact, he will start with a first-class endowment. There is probably never to be in his life quite so proper a time to apply this knowledge to useful purposes. To start right in any enterprise is the only way to keep right *all* the way through. The boy who knows he can only master the trade by hard work has started right. The boy who imagines he is to become a machinist, in any sense of the word worth considering, through the virtue of being an universal genius has started wrong. He may, as a boy, have heen able to whittle out better steam engines and saw mills than other boys, but as a man, he will find that first-class machinery is not made that way. It undoubtedly *may* be a good thing to have a natural talent in the direction of one's vocation, but, unfortunately, it *is* frequently—perhaps generally—quite the reverse. Its possessors too often expect it to take the place of hard work and persistent effort. The boy who works the hardest is the one to win every time. Grown up boys have sometimes a way of letting themselves down through comparative failures, by accrediting their more fortunate competitors with "genius;" but they would generally be right if they substituted hard work for "genius." The boy who starts right fully understands that he isn't working for fifty cents a day and Saturday night, and you never hear much grumbling from him. He never gets worked up to the idea that some one is to teach him the trade. He settled from the beginning that he had that to do for himself, and he will do it, too. If he is a "genius," he will use the quality of it for just what it is worth to him, but he won't crowd it, and lean on it, and sit down and brag about it, while his slower companions get out of his sight, leaving him, like some men, with nothing to brag about but what they might have done. If, on the contrary, he isn't a bit of a "genius," and can't see how things go together as well as his fellows, he won't be discouraged. He will have an "abiding faith" that in the end he will know, and when he finds out he won't forget. The boy who starts right is not going to put in three years of chronic grumbling because he don't get a chance. He has made up his mind to learn the machinist's trade; and, amongst other things that he will make, will be his opportunities to learn it. He understands, in an innocent way, the use of diplomacy, and will contrive to get along, if you shut him up in the blacksmith shop. The first time he goes to help put an engine in a boat, he will know why John didn't take a level with his kit, because John will tell him that, and a good many other things besides. He may not find out these things because he is particularly smart, but because he has the by-no-means-common habit of being in John's way just when he is wanted, and a machinist, like another mortal, sometimes improves on the Golden Rule, and does as he is done by. In the shop he will give Tom a pull, and Joe a lift, without being specially invited to do so by the foreman, and he will know all the time that Tom and Joe will give him pulls and lifts over the hard places. There may not be much disinterested benevolence about it; it's simply a swap, in which all parties make money. The boy who starts right, is the one who will keep right; and keeping right, as a matter of course, means ending right. Is the end worth the means? In the first place, that boy will be a machinist—not a mere workman. The coming machinist will be a man skilled in the construction of machines and machinery. The workman will be a man skilled in the use of the tools used in the trade. The difference between the two will be more marked in the future than in the past.

The argument sometimes flippantly advanced, that improved tools are taking the place of the skill of the machinist, is the thinnest kind of nonsense. The exact reverse is the case, and in a marked degree. There never was a time in the history of the trade when the machinist as distinguished from the workman, was in such demand. When our machine tools are made to plan and to reason—to estimate correctly the value of the material upon which they are employed—and a hundred other things which require thought and observation—amongst others the reproduction of themselves in improved form—then, and not till then, the brains of the machinist may be dispensed with. But until that time shall come considerable energy and research will be devoted by our manufacturers to looking for men who can do these things; and the refinement in tools and appliances demand a corresponding refinement and skill in the man they are looking for.

It is sometimes gravely remarked that the machinist of to-day is inferior to his fellow of twenty-five years ago; that he is not competent to do the hand-work that was then done, &c. It is quite probable that at the present time more men, proportionally, are employed in some capacity in connection with the machine business, who are not competent to do good hand-work, than were thus employed twenty-five years ago; but the machinist of to-day, by virtue of more intelligence, better education, and better tools, is able to do better hand-work than was ever done before. He isn't foolish enough to fit up connecting rods with the hammer, chisel and file, but it is without sense to say he cannot do it. The difficulty is not here at all. It is all in the fact that the demand is for better work now than was demanded then, and it requires increased skill in the machinist to produce it. The coming machinist will be a man who thinks more, and who thinks to better purpose than those who have gone before him. One man may be able to do considerable brain work for those under him, but if he does all that is necessary to be done in a machine shop it will be a small one. The boy who starts right will realize that the coming machinist will be an educated man; not necessarily up in polite literature—probably not a Greek scholar—but he will be well educated in the special branches connected with his business. Especially will he understand the nature, strength, behavior and peculiarities of the metals he works; not in the strict sense of the word as an original investigator, perhaps, but by supplementing the knowledge gained by reading, with his constant every-day observation.

It must be admitted that the knowledge that ought to be possessed by the coming machinist looks large in the aggregate, but the boy who starts right will apply himself to learn these things, because they elevate him in his business, and in his social relations, and because it is altogether a pleasure to be acquainted with them; and he will find ample time, no matter how limited his previous opportunities may have been; and lastly the boy who starts right understands that a good machinist is a man of much more consequence to himself and to the world than a poor lawyer or doctor, or even than a poor minister.

A material that can be carved may be made out of peeled potatoes, which is prepared for this purpose by being first blackened for thirty-six hours in eight parts of sulphuric acid to one hundred of water; it is next dried with blotting paper, and then pressed. The French now manufacture pipes, in close imitation, it is said, of meerschaum, from this novel substance. A heavy pressure gives a material so hard, that good billiard balls, in imitation of ivory can be made from it.

To Render Cotton Clothing Inflammable.—A German chemist announces that cotton clothing can be made practically uninflammable by the simple addition of a teaspoonful of borax to each pint of starch, after the latter has been made ready for use.

Complete Organization of the American Society of Mechanical Engineers.

The preliminary meeting for the formation of the American Society of Mechanical Engineers, which was held at the office of the American Machinist, February 16 last, at the call of Prof. John E. Sweet, Prof. R. H. Thurston, and Mr. A. L. Holley, is still fresh in the minds of our readers. A second meeting of engineers and others interested in forming a national association took place on Wednesday, April 7, in the large hall of the Stevens Institute, Hoboken, N. J., which was kindly placed at their service by President Morton. There were present nearly a hundred gentlemen, who showed great interest in the matters under consideration.

Among those present were:

H. R. Worthington, N. Y. City.
Thomas R. Pickering, Portland, Conn.
Chas. B. Richards, Hartford, Conn.
Lewis F. Lyne, Jersey City, N. J.
Samuel S. Webber, N. Y. City.
A. Vanderbilt, N. Y. City.
John Fish, N. Y. City.
Wm. Hewitt, Trenton, N. J.
Jackson Bailey, N. Y. City.
F. H. Richards, Springfield, Mass.
Carleton W. Nason, N. Y. City.
W. H. Hoffman, Passaic, N. J.
F. F. Hemenway, Troy, N. Y.
David N. Melvin, Linoleumville, Staten Isd.
John L. Gill, Jr., Pittsburg, Pa.
John M. Wallis, Baltimore, Md.
C. H. Brown, Fitchburg, Mass.
John Scott, Willimantic, Conn.
Ed. W. Thomas, Willimantic, Conn.
Wm. E. Barrows, Hartford, Conn.
Albert Stearns, Brooklyn, N. Y.
Fred'k Keppy, Bridgeport, Conn.
F. Firmstone, Easton, Penn.
James A. Burden, Troy, N. Y.
Francis E. Galloupe, Providence, R. I.
Harris Tabor, Corning, N. Y.
Jno. W. Cloud, Altoona, Penn.
R. H. Soule, Baltimore.
Joseph J. White, Smithville, N. J.
Geo. S. Strong, Philadelphia.
Joshua Rose, N. Y. City.
C. C. Newton, Cleveland, O.
Fred'k M. Wheeler, N. Y. City.
Lycurgus B. Moore, N. Y. City.
M. N. Forney, N. Y. City.
President Henry Morton, Stevens Institute of Technology.
W. H. Weightman, N Y. City.
John F. Ward, 133 Mercer St., Jersey City.
Charles W. Isbell, N. Y. City.
John Cotter, Norwalk, Conn.
J. C. Bayles, N. Y. City.
W. H. Scranton, Oxford Furnace, N. J.
Charles T. Thompson.
Washington Jones, Philadelphia, Penn.
Prof. John E. Sweet, Syracuse, N. Y.
W. F. Durfee, Bridgeport, Conn.
Robert W. Hunt, Troy, N. Y.
Horace B. Miller, N. Y. City.
W. L. Sweetland, New Haven, Conn.
H. A. Hill, Boston, Mass.
Eben F. Wells, N. Y. City.
G. Leverich, Brooklyn, N. Y.
A. H. Emery, C. E., N. Y. City.
Wm. H. Wiley, N. Y. City.
Geo. B. Mallory, N. Y. City.
E. D. Leavitt, Jr., Cambridgeport, Mass.
W. E. Ward, Port Chester, N. Y.
Chas. T. Porter, Newark, N. J.
Stephen W. Baldwin, Yonkers, N. Y.
C. C. Collins, Newark, N. J.
Alfred B. Couch, Philadelphia, Penn.
Jerome Wheelock, Worcester, Mass.
Prof. Samuel W. Powel, Ithaca, N. Y.
Horace Lee, Philadelphia, Penn.
George A. Barnard, N. Y. City.
Gardner C. Hawkins, Boston, Mass.
Wm. Lee Church, N. Y. City.
George M. Copeland, N. Y. City.
David P. Davis, Jersey City, N. J.
Robert Grimshaw, Ph. D., Philadelphia.
W. Barnet Le Van, Philadelphia.
Chas. A. Moore. Boston, Mass.
R. G. Ewer, New York City.
Wm. G. Logan, Brooklyn, E. D.
H. E. Parson, New York City.
H. S. Hayward, Jersey City, N. J.
Chas. Gordon Buchanan, Rockaway, N. J.
Chas. Sperry, Westbrook, Conn.
Robt. Briggs, C. E., Philadelphia.
A. Faber Du Faur, New York City.
John Bogart, C. E., New York City.
Prof. DeVolsen Wood, Hoboken, N. J.
Prof. S. W. Robinson, Columbus, O.
Charles Oferry, Westbrook, Conn.
F. W. Bacon, Boston.

A number of gentlemen deeply interested in the movement (including several members of the Committees on Organization and Nominations), were unavoidably prevented from attending this meeting, owing to the demands of private business and other causes.

A large number of applications for membership (exceeding in numbers the attendance at this meeting), have already been received, and will be placed in the hands of the Council for consideration. Among these applications is that of Thomas A. Edison, of Menlo Park, N. J., for life membership.

Owing to the illness and consequent absence of Mr. A. L. Holley, Chairman of the preliminary meeting, Mr. Henry R. Worthington, of New York, was chosen to preside, and Mr. James C. Bayles, Editor of the *Iron Age*, to act as secretary of the meeting.

The President said the meeting had been called for the purpose of considering the rules and regulations of the proposed association, and he proposed first to read the report of the committee to whom this subject had been referred by the preliminary meeting.

The committee on organization, consisting of the following gentlemen: Henry R. Worthington, Chairman, Alex. L. Holley, Eckley B. Coxe, Jackson Bailey, Gen. Q. A. Gillmore, Prof. Wm. P. Trowbridge and M. N. Forney, reported an amended code of rules for the consideration of the meeting.

The president, Mr. Worthington, acting in his capacity of Chairman of the Committee on Organization, spoke substantially as follows:

As chairman of the Revising Committee, allow me to state that these rules are submitted by the committee with some hesitation. Their revision has led to the discussion of many difficult points upon which we had no precedents for our guidance, and it is well that they should be carefully considered now, as the success of the Society will depend very largely upon the wisdom with which these rules are framed, and carried out. The principal changes that have been made from the original report, are, first, as to the appointment of secretary, which is placed in the hands of the Council, instead of the body of members, and the Council are delegated powers to discharge him for cause. It is believed that the Council will have better opportunities than the scattered members of noting the manner in which he discharges the duties of his difficult position. Second—in the election of officers, the commulative system of voting has been adopted, so that the minority may have a voice in the management of the Society. Third—the rules with regard to the qualifications of members; and *here* the committee have found the greatest difficulty.

With regard to the eligibility of members, the Committee were obliged to choose between three views: first, that which would make membership practically *free* to everybody who chose to apply, whether qualified or not; second, that which, without attempting to define very accurately in advance the necessary qualifications, leaves the admission of the candidate to the careful judgment of the Council and the Society; and third, that which, by attempting to *accurately define* the qualifications necessary for admission, would set up rigid standards, which would leave the Council and the Society practically powerless either to admit those engineers who unquestionably should enter, or to exclude those who are not qualified by character and attainments to advance the interests of mechanical progress. Of these three views, after patient deliberation, the committee have chosen the *second* plan, namely, to define the desired qualifications in general terms only, and to leave the admission of the candidates to the sober judgment and common sense of the council and the society.

This rule, especially, the committee trust, will be referred back to them for further consideration, unless it should prove to be considered worthy of adoption in its present form. We will now proceed to the discussion of the rules.

It was moved and carried that these articles be read seriatim, and that those objected to should be marked for discussion, the remainder being adopted at once.

The proposed rules were then read.

Most of the articles were adopted as read, only a few being held for discussion. Among these were Nos. 3 and 4, the following substitute being presented in place of the former:

"Candidates for membership of the American Society of Mechanical Engineers shall embrace all persons engaged practically or professionally in callings connected with mechanical engineering, either as constructors or teachers."

It was argued that this would be more elastic than the article proposed by the committee, and at the same time time better devised for keeping out those whom the society did not want admitted into their ranks.

It was then suggested that this amendment would bar out theoretical engineers, which was far from the intention of the society; and a motion was made that the words "constructor" and "teacher" be stricken out of the substitute.

It was further urged that it was very important to have theoretical and experimental engineers represented in the society.

The point was closely discussed, but in the end the substitute was lost. Various other amendments were offered, but, with slight verbal alteration, the article passed.

At this point Professor Morton invited the meeting to lunch at his house, and the gentlemen present gladly partook of his kindly hospitality.

Shortly after two o'clock they reassembled, and business commenced with a vote of thanks to President Morton, and the Stevens Institute, moved by Dr. Grimshaw in a humorous speech.

The motion was carried by acclamation. Mr. John Bogart, secretary of the Civil Engineers' Society, said he had been requested to place the rooms of the Civil Engineers in New York, at the disposal of the new association, for its next meeting.

The offer was accepted with thanks.

The discussion of the rules being proceeded with, Professor Sweet suggested that it would save time to consider only such amendments as were already proposed, and such as should be handed in at once in writing. Several were at once handed in, upon which it was moved, in order to test the sense of the meeting, that the articles, as reported by the committee with the amendments already accepted, be adopted as a whole.

It was then pointed out that Articles 21 and 23, in regard to the officers of the Society, did not agree, and it was moved that they be referred back to the Committee on Organization, which was done, and their report was afterwards adopted.

In reply to various resolutions on minor points, it was urged by motion, that the meeting was only wasting time in making these alterations, as the 43d article allowed amendments to be made at any time subsequent, upon due notice.

The motion, after being well discussed, was carried with cheers.

Motion was then made that the Committee on Organization act as temporary council, and decide as to the eligibility of members.

In reply to this, the method adopted by the Pilgrim Fathers in settling their land disputes with the Indians, was commended to the meeting as a fit course to pursue. It was said they had a meeting in regard to the Indian lands, and they voted, first that the earth is the Lord's, and the fullness thereof; second, that the land was given to His saints; and third, that they were the saints. [Laughter.]

To settle this question it was urged that if the gentlemen named in the report of the Nominating Committee for the various officers were elected, they would form the only proper council.

Some one moved that all present be considered members of the organization, to which objection was made that some were eligible as *associates* only, and it was hardly proper to make them *members* against their will.

One gentleman moved that a committee on examination be appointed to look over the names of candidates for membership.

Another suggested that all present should go into a committee of the whole, and examine each other. [Laughter.]

It was then moved that the names be called, and that those who considered themselves eligible for admission as members, honorary members, associates or juniors, should give their names in under either of those designations, and be forthwith enrolled. In reply to this, it was pointed out that the meeting was a *caucus* merely, at which those present had power to elect the officers to form the association. This was supported by motion, that the *caucus* (cheers) proceed to listen to the nominations of the nominating committee. The adoption of this commendable course relieved the meeting from the little tangle into which it might have fallen.

Prof. John E. Sweet offered the report of the nominating committee, which embraced the following selections:

FOR PRESIDENT:

Professor R. H. Thurston, of the Stevens Institute of Technology.

FOR VICE-PRESIDENTS:

Henry R. Worthington, of New York.
Coleman Sellers, of Philadelphia.
Eckley B. Coxe. of Drifton, Pa.
Gen. Q. A. Gillmore, U. S. A.
Wm. H. Shock, U. S. N.
Horace B. Miller, of New York.

FOR MANAGERS:

Professor Wm. P. Trowbridge, of Columbia College.
Theo. N. Ely, of Altoona, Pa.
J. C. Hoadley, of Lawrence, Mass.
Washington Jones, of Philadelphia.
Wm. B. Cogswell, of Mine La Motte, Mo.
F. A. Pratt, of Hartford, Conn.
Chas. B. Richards, of Hartford, Conn.
Wm. B. Bement, of Philadelphia.
S. B. Whiting, of Pottsville, Pa.

FOR TREASURER:

Lycurgus B. Moore, of New York.

Immediately upon the reading of this list of names, Mr. Horace B. Miller, one of the gentlemen nominated as vice-president, after expressing due recognition of the honor tendered him, asked leave to decline, and suggested that the name of Mr. A. L. Holley of New York, be substituted for his own. Mr. Miller's request was granted, and Mr. Holley's name inserted.

All the candidates named on the list were then elected by a unanimous rising vote.

To the suggestion that the West should have a larger representation in the management, Professor Sweet, speaking on behalf of the nominating committee, explained, that several Western gentlemen whose names had been suggested for this purpose had expressed as their opinion, that in this early stage of the society's existence, gentlemen living nearer New York would be better able to attend the business meetings of the council, and therefore would add more working strength to the society for the present.

A suggestion was then made that a clause in the rules to secure the expulsion of unworthy members would be found desirable in practice, and, in accordance with article 43, written notice of an intended motion to this effect at the November meeting was given.

The organization of the society having been thus practically completed, the meeting adjourned, subject to the call of the council.

Rules of the American Society of Mechanical Engineers.

Adopted at the Meeting for the Organization April 7, 1880.

OBJECTS.

ART. 1. The objects of the American Society of Mechanical Engineers are to promote the Arts and Sciences connected with Engineering and Mechanical Construction, by means of meetings for social intercourse, and the reading and discussion of professional papers; and to circulate, by means of publications among its members the information thus obtained.

MEMBERSHIP.

ART. 2. The Society shall consist of Members, Honorary Members, Associates, and Juniors

ART. 3.—Mechanical, Civil, Military, Mining, Metallurgical, and Naval Engineers and Architects may be candidates for Membership in this Society.

ART. 4. To be eligible as a Member, the candidate must have been so connected with some of the above specified professions as to be considered, in the opinion of the Council, competent to take charge of work in his department either as a designer or constructor, or else have been connected with the same as a teacher.

ART. 5. *Honorary Members* not exceeding 25 in number, may be elected. They must be persons of acknowledged professional eminence, who have virtually retired from practice.

ART. 6. To be eligible as an *Associate*, the candidate must have such a knowledge of or connection with applied science as qualifies him, in the opinion of the Council, to co-operate with engineers in the advancement of professional knowledge.

ART. 7. To be eligible as a *Junior*, the candidate must have been in the practice of engineering for at least two years, or he must be a graduate of an engineering school.

[The term "Junior" applies to the professional experience, and not to the age of the candidate. Juniors may become eligible to Membership.]

ART. 8. All Members and Associates shall be equally entitled to the privileges of Membership, provided that Honorary Members who are not also Members or Associates, and Juniors shall not be entitled to vote, nor to be members of the Council.

ELECTION OF MEMBERS.

ART. 9. All candidates for admission to the Society, excepting candidates for honorary membership, must be proposed by at least three members, or members and associates, to whom they must be personally known, and be seconded by two others. The proposal to be accompanied by a statement in writing of the grounds of their application for election, including an account of their professional service.

ART. 10. All such applications and proposals received by the Council up to 30 days before a regular meeting shall, at least 20 days before such regular meeting, be passed upon by the Council. The Secretary shall, at least 20 days before such regular meeting, mail to each member and associate, in the form of a letter-ballot, the names of candidates recommended by the Council for election.

ART. 11. Any member or associate entitled to vote may erase the name of any candidate, and return to the Secretary such ballot enclosed in two envelopes, the inner one to be blank and the outer one to be indorsed by the voter.

ART. 12. The rejection of any candidate for admission as member, associate, or junior by *seven* voters shall defeat the election of said candidate. The rejection of any candidate for admission as honorary member by three voters shall defeat the election of said candidate.

ART. 13. The said blank envelopes shall be opened by tellers in a regular meeting, and the names of candidates elected shall be then announced. The names of candidates not elected shall neither be announced nor recorded in the proceedings.

ART. 14. Candidates for admission as honorary members shall not be required to present their claims; those making the nominations shall state the grounds therefor, and shall certify that the nominee will accept if elected. The method of election in other respects shall be the same as in case of other candidates.

ART. 15. All persons elected to the society, excepting honorary members, must subscribe to the rules and pay to the Treasurer the entrance fee and yearly dues before they can receive certificates of membership. If this is not done within six months of notification of election, the election shall be void.

ART. 16. The proposers of any rejected candidate may, within three months after such rejection, lay before the Council written evidence that an error was then made, and if a reconsideration is granted, another ballot shall be ordered.

ART. 17. The Council shall pass upon applications of Juniors for membership, and shall order ballots upon such recommendations, in the manner hereinbefore described.

FEES AND DUES.

ART. 18. The initiation fee of members and associates shall be $15, and their annual dues shall be $10 per year, payable in advance at the annual meeting, *provided* that persons elected at the meeting following the annual meeting shall pay $8, and persons elected at the meeting preceding the annual meeting shall pay $4, as dues for the current year. The initiation fee of Juniors shall be $10, and their annual dues shall be $5 per year, payable in advance. Any member or associate may become, by the payment of $150 at any one time, a life member and associate, and shall not be liable thereafter to annual dues.

ART. 19. Any member, associate or junior in arrears may, at the discretion of the Council, be deprived of the receipt of publications, or stricken from the list of members, when in arrears for one year; *provided*, that such person may be restored to membership by the Council on payment of all arrears, or by re-election after an interval of three years.

OFFICERS.

ART. 20. The affairs of the society shall be managed by a Council, consisting of a President, six Vice-Presidents, nine Managers, and a Treasurer, who shall be elected from among the members and associates of the Society at the annual meetings, to hold office as follows:

ART. 21. The President and the Treasurer for one year (and no person shall be eligible for immediate re-election as President who shall have held that office subsequent to the adoption of these rules, for two consecutive years), the Vice-Presidents for two years, and the Managers for three years; and no Vice-President or Manager shall be eligible for immediate re-election to the same office at the expiration of the term for which he was elected. Provided that at the meeting for organization the entire board of elective officers and managers shall be chosen of whom the President, the Treasurer, three Vice Presidents and three Managers shall serve until the first Thursday of November 1881; three Vice Presidents and three Managers shall serve until the first Thursday of November 1882 and three Managers shall serve until the first Thursday of November 1883. The holding for the several terms shall be determined by lot among them.

ART. 22. A Secretary, who may or may not be a member of the Society, shall be appointed for one year by a majority of the members of the Council at its first meeting after the annual election, or as soon thereafter as the votes of a majority of the members of the Council can be secured for a candidate. The Secretary may be removed by a vote of twelve members of the Council at any time after one month's notice has been given him by a majority of its members to show cause why he should not be removed, and he has been heard to that effect. The Secretary may take part in any of the deliberations of the Council, but, if not a member of the Society, thall not have a vote therein. His salary shall be fixed for the time he is appointed by a majority vote of the Council.

ART. 23. At each annual meeting after the first, a President, three Vice-Presidents, three Managers, and a Treasurer shall be elected, and the term of office shall continue until the adjournment of the meeting at which their successors are elected.

ART. 24. The duties of all officers shall be such as usually pertain to their offices, or may be delegated to them by the Council or the society; and the Council may in its discretion require bonds to be given by the Treasurer. At each annual meeting the Council shall make a report of proceedings to the society, together with a financial statement.

ART. 25. Vacancies in the Council may occur by death or resignation; or the Council may by vote of a majority of all its members declare the place of any officer vacant, on his failure for one year, from inability or otherwise, to attend the Council meetings or perform the duties of his office. All vacancies shall be filled by the appointment of the Council, and any person so appointed shall hold office for the remainder of the term for which his predecessor was elected or appointed; *Provided*, that the said appointment shall not render him ineligible at the the next annual meeting.

ART. 26. Five members of the Council shall constitute a quorum; but the Council may appoint an Executive Committee, or business may be transacted at a regularly called meeting of the Council, at which less than a quorum is present, subject to the approval of a majority of the Council, subsequently given in writing to the Secretary, and recorded by him with the minutes.

ART. 27. No bill shall be paid for the Society until it has been certified by the person authorized to contract it, and audited by the committee on finance.

ELECTION OF OFFICERS.

ART. 28. At the regular meeting preceding the annual meeting, a nominating committee of five members, not officers of the society, shall be appointed, and this committee shall, at least 30 days before the annual meeting, send the names of nominees to the Secretary, who shall at once mail the said list of names to each member and associate, in the form of a letter ballot.

ART. 29. In the election of Vice-Presidents each member and associate may cast as many votes as there are vice-presidents to be elected. He may give all these votes to one candidate, or distribute them among more as he chooses. Managers shall be voted for in the same way.

ART. 30. Any member or associate entitled to vote may vote by retaining or changing the names on said list, leaving names not exceeding in number the officers to be elected, and returning the list to the Secretary; such ballot inclosed in two envelopes, the inner one to be blank and the outer one to be indorsed by the voter; *Provided* that no member or associate in arrears since the last annual meeting shall be allowed to vote until said arrears shall have been paid.

ART. 31. The said blank envelopes shall be opened by tellers at the annual meeting, and the persons who shall have received the greatest number of votes for the several offices shall be declared elected.

MEETINGS.

ART. 32. The annual meeting of the society shall be held in the city of New York on the first Thursday in November, at which a report of the proceedings of the society and an abstract of the accounts shall be furnished by the Council; the Council may change the time of the annual meeting, and shall in th a case give six months notice to members and associates.

ART. 33. Two other regular meetings of the society shall be held in each year, at such times and places as the Council may appoint. At least 30 days notice of such meetings shall be mailed by the Secretary to members, honorary members, associates and juniors.

ART. 34. Special meetings may be called whenever the Council may see fit; and the Secretary shall call a special meeting at the written request of twenty or more members. The notices for special meetings shall state the business to be transacted, and no other shall be entertained.

ART. 35. Any member, honorary member or associate may introduce a stranger to any meeting; but the latter shall not take part in the proceedings without the consent of the meeting.

ART. 36. Every question which shall come before the society shall be decided, unless otherwise provided by these rules, by the votes of a majority of the members and associates present, provided there is a quorum.

ART. 37. At any regular meeting of the society, thirteen or more members and associates shall constitute a quorum.

PAPERS.

ART. 38. The Council shall have power to decide on the propriety of communicating to the society any paper which may be received, or to refer it back to its author for revision or amendment, and they shall be at liberty, when they think it desirable, to direct that any paper read before the society, shall, with the author's consent, be printed.

ART. 39. Intimation, when practicable, shall be given at a general meeting, of the subject of the paper or papers to be read, and of the questions for discussion at the next meeting.

ART. 40. The copyright of all papers communicated to, and accepted by the society, shall be vested in it, unless otherwise agreed between the Council and the author. Provided that the author shall in no case be deprived of his right to give copies of his papers for publication to any reputable journal, in which he may desire to see them printed after the same shall have been read, but the Society shall not be responsible for such unofficial publication.

ART. 41. The author of each paper read before the society shall be entitled to twelve copies, if printed, for his own use, and shall have the right to order any number of copies at the cost of paper and printing, provided said copies are not intended for sale.

ART. 42. The society is not, as a body, responsible for the statements of fact or opinion, advanced in papers or discussions, at its meetings; and it is understood that papers and discussions should not include matters relating to politics or purely to trade.

AMENDMENTS.

ART. 43. These rules may be amended, at any annual meeting, by a two-thirds vote of the members present, provided that written notice of the proposed amendment shall have been given at a previous meeting.

The employees at the iron works of E. & J. Brooke, at Birdsboro', Pa., have received an advance of 10 per cent. in their wages.

Letters from Practical Men.

Editor American Machinist:

I send you the following answer to Mr. Frank H. Richards' problem in screw cutting, given in this week's paper, as I understand it.

As he does not give any particular screw, I take the one on the lathe I am running, which is four threads per inch. If we take the meter to be 3 feet $3\frac{3}{8}$ inches the centimeter will be $\frac{63}{160}$ inch. The ratio, then, between pitch of screw to be cut and pitch of screw on lathe will be: $\frac{63}{160}$ is to $\frac{1}{4}$ as .03 is to 40.

Let us take, for spindle, 90, which is $\frac{10}{7}$ of 63, and for screw 80, which is twice 40. The ratio of first and second studs should then be, $\frac{10}{7} : 2$, or $10 : 14$. Multiply each term of this ratio by the same number, which does not change its value—say 5—we have 50 and 70 as the two studs. The gear is then $90 — 50 — 70 — 80$.

But if we are to take the centimeter as being exactly .3937 inch, it will be much more difficult to find wheels, on account of the odd number of teeth required. The proportion in this case would be .3937 is to 4 as 3937 is to 2500. Resolving these into their factors, we have 31×127 for the products of the drivers, and 50×50 for the products of the driven. The gear would then be $31 — 50 — 127 — 50$.

I have also worked out four other gears which do not come out exactly, but approximate to within $\frac{1}{5000}$ inch.

They are: $101 — 50 — 31 — 50$.
$73 — 50 — 54 — 50$.
$57 — 50 — 69 — 50$.
$51 — 50 — 77 — 50$.

For the two fifty wheels may be substituted 25 and 100.

ELMER E. BOYER.

Sunbury, Pa., April 3, 1880.

R. Hoe & Co.'s Horizontal Hydraulic Press.

The illustration shows the pattern used for pressing any seeds or material from which oil may be extracted. The cylinder is of solid wrought iron, and lined with copper. The rods are forged from picked scrap iron. Two heavy cast iron frames, securely fastened to the rods with the head of the press, form the box or hopper for receiving the bags containing the seed, etc., and the twelve iron plates to go between the bags. The plunger is forced into the box by means of the ram of the cylinder. The ram is drawn back again to place by counter weights. A tank for catching the oil is furnished with press, and is placed directly under the hopper. This press is very strongly built, and will give a pressure of 390 tons.

Boiler Proportion and Construction—Gauge Cocks, Water Gauges, Safety Valves, and Stop Valves.

BY WM. H. HOFFMAN.

The improvements in boiler mountings have, I suppose, nearly kept pace with those of boiler design and construction. Allowing this to be a fact, it must be admitted that the changes have been very slow in producing beneficial results.

Among the great variety of gauge cocks, where is there one that is not in some degree troublesome? Beginning on the inside of the appendage under notice, it is perfectly safe to say, that nine-tenths of the styles in use to-day are liable at any time to clog and be useless upon very slight provocation. As the water falls to the line of opening with the average style gauge cock, all that is necessary to render this important fixture entirely unfit for service is a few slight particles floating on the surface, or water level, and any attempt to free the cocks under pressure can be properly termed a "red-hot" job. They can only be thoroughly cleaned by removal from the boiler after steam is off. Now, a gauge cock can be made that will have a half or three-quarter-inch hole all the way through it, to within, say, $\frac{3}{8}$" of the front end, the remaining portion having a hole for discharge, say, $\frac{1}{8}$ or $\frac{1}{10}$ inch in diameter. Then, just back of the small opening at front end, there should be a two-way three-ported cock, so arranged that when the small aperture at any time becomes closed by gradual, or even sudden, filling up, the $\frac{1}{2}$" or $\frac{3}{4}$" two-way cock can be closed to front end, and the same movement will open the discharge at once to the blow-off drain pipe. The obstruction can then be removed from the front end without danger of burning the operator, if it is not blown out through the drain.

A gauge cock should never enter the boiler head or shell, but should be screwed into a liberal sized water cylinder. For an 80 H. P. boiler, this cylinder should be $3\frac{1}{2}$" diameter inside, and connected to the boiler head or shell by two $1\frac{1}{2}$" pipes. By this means, all agitation from circulating currents and priming can, in a great measure, be avoided.

The bottom end of water cylinder must have a $1\frac{1}{4}$" blow-pipe and valve fitted to it, and discharging into the blow-off drain pipe. The cylinder should be a steel or brass casting, about $\frac{3}{8}$" thick, and, for a 66" boiler, 24" long. The glass water-gauge will also be attached to it, as well as one of the steam gauges. *Every boiler* should have *two* steam gauges. The water cylinder has been used by some builders for years, but most of them are very much too small, as well as the pipe connecting them with the boiler.

Regarding safety valves, I have been surprised to find the variety of sizes placed on boilers of like capacity by different builders. On a 60" shell boiler, the valves vary from $2\frac{1}{2}$" to $4\frac{1}{2}$" diameter. Now, there are $4\frac{9}{10}$ square inches in a $2\frac{1}{2}$" safety valve, and $15\frac{9}{10}$ square inches in a $4\frac{1}{2}$" valve; so, according to these areas, some one is "all at sea" in the matter of safety valves.

In the first place, every boiler should have *two* safety valves; one, a lever and weight pattern, the other, a spring, or pop valve. The opening in *each*, when raised to its limit of lift (which is always very small), should be large enough to prevent the blowing-off pressure being exceeded more than ten per cent. The size or area of safety valves, depends, of course, on the amount of water evaporation with a certain quantity of fuel in a given time; and it is a well-known fact, that no safety valve raises over seven per cent. of its diameter—or, in other words, a 4" safety valve will never lift more than $\frac{1}{4}$ inch, and $\frac{1}{32}$ inch is the usual amount for this size valve with the ordinary working pressures.

Therefore a $2\frac{1}{2}$" valve would have to raise more than double the distance of the 4" valve to relieve the pressure in the same time, and in case of sudden closing of stop valves, or an undue pressure from any cause, the $2\frac{1}{2}$" valve would be liable to *fail* to relieve the pressure in season to prevent the straining of boiler, and perhaps its explosion, if defective.

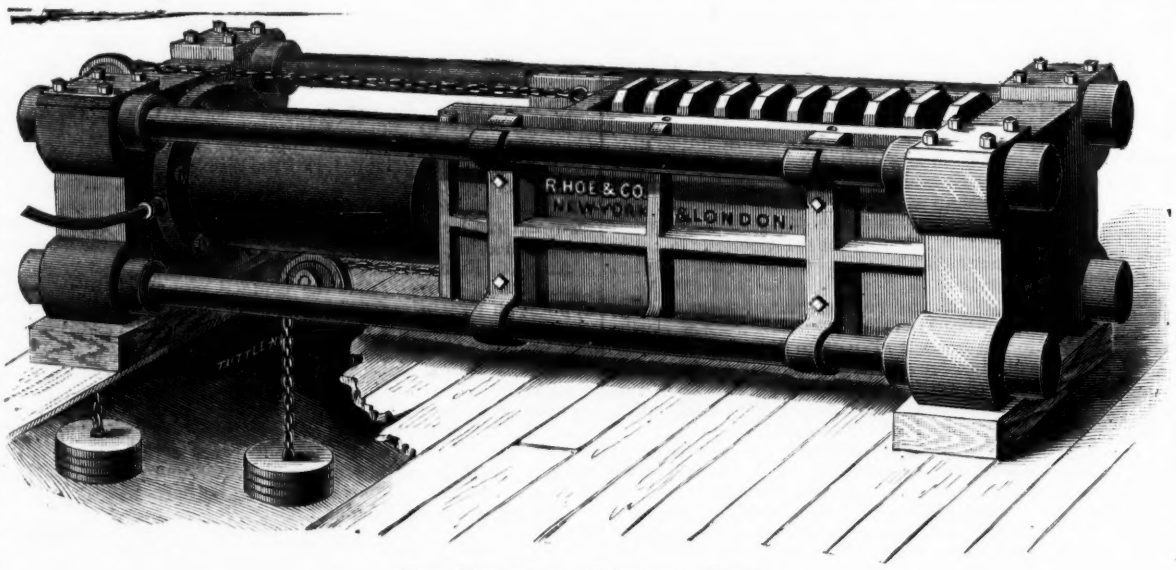
A 66" shell and 14 feet boiler, 54 tubes, 80 H. P. should have two $4\frac{1}{2}$" safety valves, and neither will ever lift over $\frac{1}{8}$ inch. They will be *absolutely* safe, if examined daily, as *every valve* about a boiler should be. The weight lever must never be longer than the regular working standard pressure requires. There can be no overloading then, unless extra weights are used, and any man who will resort to this vice should be introduced to the paymaster without delay.

The majority of safety valves have their seats fitted on a bevel. The *spherical* form of seat is much better and relieves more readily, while its face can always be automatically shifted a little on the seat. The lever pins should work on knife edges, thus offering the minimum resistance to rapid opening.

There should also be two stop valves on a boiler, one, a globe valve, the other, a balanced lever valve. The locomotive throttle style is good. The lever valve should be used only in case of an emergency, such as the racing of engine caused by derangement of regulator, breaking of main belts, bursting of steam pipes, etc.

The handle or lever should be so arranged, that it could be operated either in engine or fire rooms. It requires too much time to close a *screw* valve, in case of accident.

All stop valves should be 25 per cent. larger than the pipes to which they are attached, in order to provide a free passage through the necessary bends, &c.



New Horizontal Hydraulic Press.

The law passed by the Indiana Legislature forbidding the garnisheeing of a man's wages, unless there are two months pay due him, has had an effect gratifying both to the employees and to their officials, who were too often annoyed by these processes.

Practical Blacksmithing—Blast Pipes and Tools.

BY FREDERICK LEWIS.

The most efficient blowers are frequently a source of trouble through badly proportioned or leaky blast pipes. All such pipes should be made of galvanized sheet iron, and of large diameters. Some persons think it economy to make small pipes, from the fact that a small amount of iron is saved at the beginning, but this is a mistake. There is a great and constant loss of power in forcing air through small pipes. There should be as few turns as possible, and every elbow should be of the lobster-tail pattern, and in shape an easy bend, to avoid the loss of air sustained in passing square or badly constructed elbows. The joints in all pipes should be soldered, except where the sections are put together. These joints should have flanges, and be provided with rubber gaskets. Blast pipes should always be placed above the ground and in an elevated position, when possible, as pipes when placed under ground are a constant annoyance and expense.

In selecting tools for a blacksmith's shop, the first step is to secure a good anvil. Referring to Fig 1, I will describe the principal features of a good one. The weight of the anvil is determined by the kind of work to be done upon it. The face should be perfectly flat, or straight both ways, with a portion of one edge rounded, as shown in the engraving. The top of the horn should be straight with the face. In selecting anvils for a large shop great care should be taken to select only those having holes of a uniform size, so that the tools made to fit *one* anvil will fit *all*, thus all annoyances from tools not interchanging are avoided. The top edges of the holes alluded to should be well rounded, so that a fillet may be left under the heads of the tools, to insure greater durability. The break should be straight, and the edges should project, so as to clear the sides of the horn. Anvils for heavy work should have the gable *a*, shaped as shown by the plain line; but for light work, it should approximate nearer to the shape of the dotted line, in order to facilitate the forging of small articles. For light work, the shape of the horn *a*, should approximate to the straight line from the point to where it is bisected by the dotted line. It should then follow the direction of the dotted line for obvious reasons. For heavy work the foregoing conditions should simply be reversed, to secure the desired strength.

A cast iron anvil with a steel face will answer well for light work, but a wrought iron anvil, with a cast steel face, is far superior to any other. The small hole through the gable should be round, and large at the bottom. This hole is only necessary for light work. An anvil should always be set level, and it is only a sort of notion that some men have, which leads them to tip the anvil. There is no philosophical reason for it. Some of the best men that I am acquainted with are so particular, in this respect, that they will often use a spirit level by which to set the face of their anvil. I believe the best way to hold the anvil upon the block is to take two pieces of flat iron, for ordinary work, about $\frac{1}{2}$"x$1\frac{1}{4}$", and round each end, making them $\frac{1}{4}$ inch in diameter. Each of these (after putting a nut upon each end) is to be bent in the shape of a yoke. Two pieces of 1"x$1\frac{1}{4}$" flat iron with a hole near each end (to admit the ends of the yokes) are to be placed in recesses, cut in the sides of the block. The yokes are now to be placed upon the anvil, one under the horn, and the other under the gable. The reader will understand that these yokes span the body of the anvil *b*, and crossing each other at the sides; the ends pass through the straight pieces referred to. By tightening the nuts, the yokes grasp the anvil in such a way, that it cannot possibly move. Some mechanics have used a plan of tapping out a hole in the center of the bottom of the anvil, then inserting a large stud bolt, and cutting a recess in the block for the application of a nut and washer. By this means the anvil may be turned round to any position necessary. The top of the block should be level, and should never project far enough to interfere with a bar of iron placed through the hole in the anvil. The corners of the anvil should always have a bearing upon the block, so as to prevent rocking.

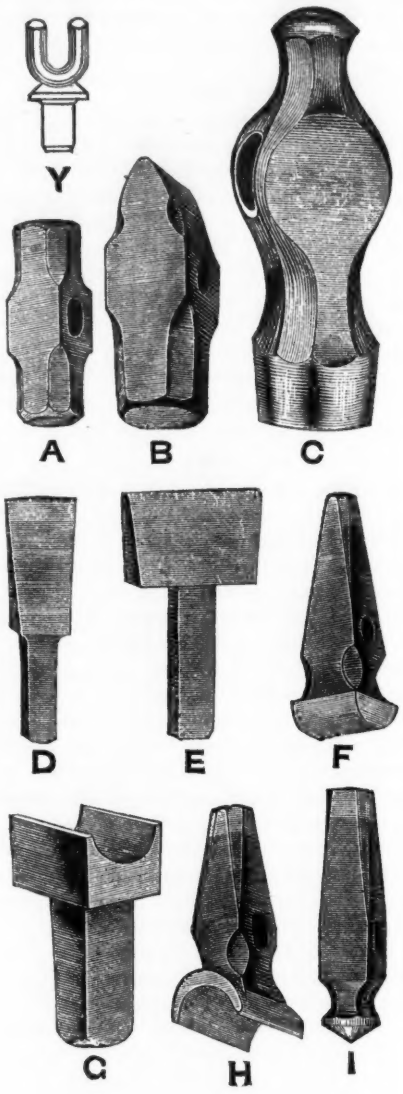
An ordinary machinist blacksmith should have the following tools, viz.: A small, and also a large hand hammer, of the pattern shown by *C*, in the engravings, which should weigh $1\frac{1}{2}$ lbs., and $3\frac{1}{2}$ lbs., respectively. A medium sized sledge *A*, weighing 7 lbs., a larger one of 11 lbs., and a heavy one of 16 lbs. in weight, both of which are represented by *B*. The faces of these sledges and hammers (except *A*) should over-balance, as they are easier to handle, and the blow is more certain.

Some ingenuity is necessary to attach a handle to a hammer or sledge, so that it may not work loose, thus endangering life and limb. The eye of the tool should be smallest in the center, and should be well tapered towards both ends. The handle should be of well seasoned hickory and driven tight. By inserting a good wedge crosswise, the handle is made to fit the eye securely, and should the handle shrink, the tool will never slip on or off. The durability, of course, largely depends upon the care taken in following the foregoing directions.

Tongs are the next consideration, the shape of which is by no means of small importance.

They should be made of the very best iron, or, what is better, a low grade of steel. The plainest tongs are represented by *K*, of which there should be four pairs, which will take iron from the thinnest up to 1" in thickness. A very handy design of tongs is represented by *L*, which are intended to hold rectangular shaped bars, such as lathe tools. There should be three pairs of these tongs.

It will be observed that these tongs have projections, or lips upon one jaw, and by making similar projections upon both jaws, these tongs will hold either flat, round, or square iron. There should be two pairs of pinchers, or bolt tongs as shown by *M*. These are very convenient for holding a bolt, as they will span the head and grasp the body. Another very convenient style of tongs for holding round and square steel, such as cold chisels, etc., is represented by *N*. The jaws of these tongs are made hollow, or V-shaped, as may be desired. The number of this style is determined by the different sizes of iron required to be handled. The pick-up tongs, shown by *O*, is an indispensable tool in every blacksmith's shop, for handling small pieces of hot iron, and other purposes. There should be one hardy, represented by *D*, for light work. It is best to have three sizes of fullers (shown by *E*, and *F*,) with the circle



varying from $\frac{3}{8}$" to 1" in diameter. There is a fuller made similar to *E*, which has a small horn attached to one end. It is known as a "beck-horn," and is very convenient for very small work. Fullers, for large work, should have a guard upon one end, to prevent the iron from rolling off. The swages shown by *G*, *H*, should be the shape of an oval, with the corners well rounded, and not a true circle, as is advocated by most mechanics. I have seen men work for a long time in trying to forge a piece of work true and smooth, with swages which were a little too small, or the top swage was not the same size as the bottom. The workman will growl and place the blame every where but where it rightfully belongs. If the swages are made half-round, as is the usual custom, it is necessary that both swages fit the work; but, if made as described, a $\frac{3}{4}$ inch swage will answer for all sizes down to $\frac{5}{8}$ inch. A countersink *I*, will be found very desirable for many purposes.

The staple tool *Y*, is also very convenient for bending round iron without bruising it, also for many other kinds of irregular work. Much trouble is experienced in many shops, because of the poor facilities for cutting up round iron. If nicked with a cold chisel, it is a slow process. Most of the leading shops

Revolving Swage Block.

have adopted a special cutting-off lathe, which is driven by power.

The illustration *X*, represents a tool designed particularly for cutting up round iron. It is simply a flat plate of iron, faced with steel on the side towards the offset. The holes are to be drilled and reamed tapering, leaving the smallest end of the hole towards the offset. These holes should be large enough to allow rough iron to slip through freely. The sizes are from $\frac{1}{4}$ inch to $\frac{1}{8}$ inch, admitting all the intermediate sizes. The tool, when finished, should be tempered. A cold chisel must be made one-sided, and having a hollow cutting edge to fit the largest sized iron; it will then do for the other sizes also. The offset referred to is to prevent the chisel from striking the anvil when in use. With these tools, which may be made to fit any size of iron, a helper can readily cut off a bar of $1\frac{1}{4}$" iron with an 18 lb. sledge. One blow will frequently sever a bar of $\frac{7}{8}$ inch iron. The heading tools *J*, should be made with the sides of the holes parallel, and should allow the iron to pass through freely, when hot. The holes should be deep, in proportion to the diameter; the deeper the better, as it is impossible to make a bolt-head square with the body in a short hole. Heading tools should generally vary in size from $\frac{1}{4}$ inch to $1\frac{1}{4}$", advancing by eighths. They should also be faced with steel and hardened. Every blacksmith should have one good cold chisel *U*, and two hot chisels *T*; also four gouges, the circles of which

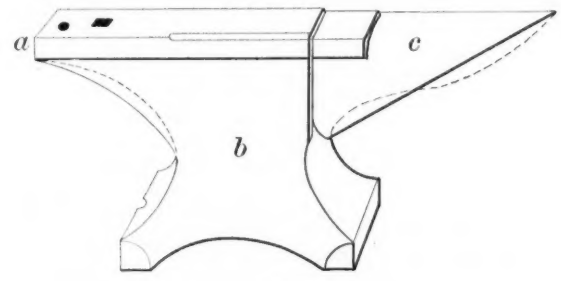
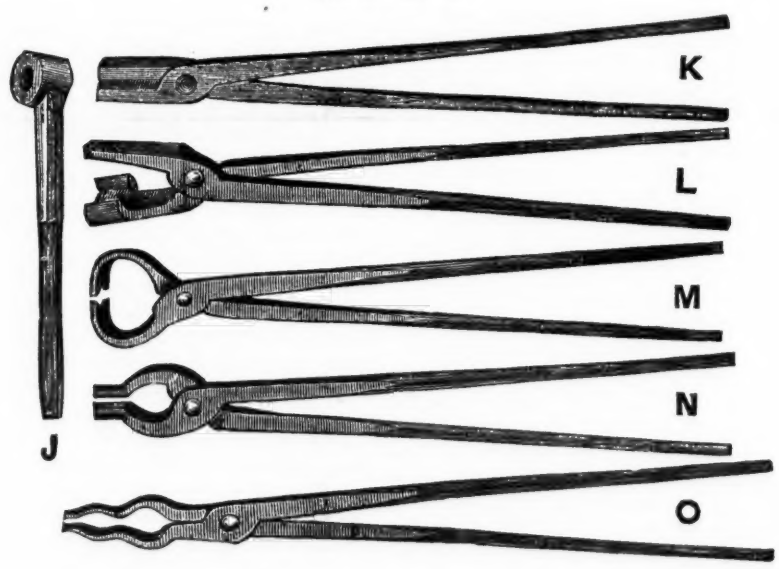


Fig 1.—Anvil.

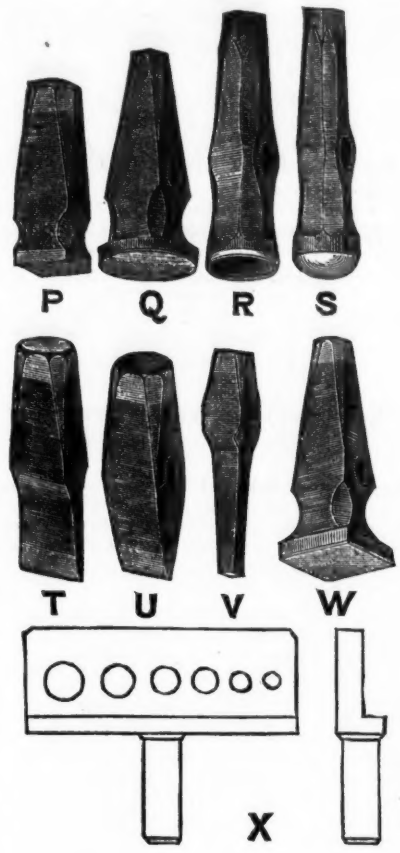


should measure $\frac{1}{2}$ inch, 1", $1\frac{1}{4}$", and $1\frac{1}{2}$". The flatter *W*, should be straight on the face, as also the set hammer *P*. A round faced flatter *Q*, is a tool that is very useful upon many kinds of work. These flatters are made both with square and round edges, round edges being the best, when they can be used. A defective piece of work, which afterwards gives way, can frequently be traced to the improper use of a square edged flatter, or set hammer, which has the effect of scoring the iron. The necessary number of punches *V*, both square and round, should be provided, and it is well to have a pair of cupping tools *R*, and *S*. Every blacksmith's shop should have a good wrought iron "leg" vise, with good, wide steel jaws, for bending and handling intricate pieces of work. Another indispensable tool is a swage block, or "sow," as it is sometimes called. The plainest form is shown in the illustration, which explains itself, while the other engraving represents a revolving swage block, which is much easier to handle. When set in the proper position, the block is prevented from turning by placing a stout iron pin through a hole in the block, as shown. The cone, which projects from one side, is also a very convenient addition. The handles of the tools named have been omitted on account of space, and are well understood. The withe handle is used very little in this country.

Horse Power of Steam Boilers.

Some writers have sought to establish a set of formulas by which any given boiler may be rated in horse-power; but in order to use them, it is necessary to place your boiler under the conditions which they assume to be correct, or to proportion it according to their specifications, or else to apply corrections for differences in these respects to such a degree as to make the calculation not only difficult, but unreliable. And in fact the case presents so many difficulties that it is next to impossible to determine what a boiler, especially an externally fired boiler, will do until it is erected. The chimney and connecting flues, and the pressure of steam of an internally fired boiler, also, have such an important effect on the performance that they must be considered before an estimate can be made of their power. To many practical engineers the statements so far advanced herein are trite matters of fact, and they would not pretend to say what the power of any given generator is till all the circumstances which affect its efficiency are named, and even then prudence would dictate a careful personal examination, as some important elements might be omitted from the statements of another, as to the conditions. In the present state of the arts and sciences, it would not be very far from the truth to say that 30 pounds of water in the condition of dry steam, under a pressure of 70 pounds above the atmosphere, an hour from feed-water, at 100° Fah., is equivalent to, or will yield, a horse-power when used in a fairly economical non-condensing engine. So to get the power of any given boiler, we have only to divide the number of pounds of water made into dry steam under these conditions by 30, and we have a simple, practical answer to the problem of to-day. It is quite another thing, however, to determine the exact proportions of a boiler that will do this, and no more, until the conditions under which it is worked are established. The most important of these conditions are the rate and perfection of the combustion, which, as has already been stated, depend on the proportions of the chimney, or on the power used to force the draft, or more properly speaking, the pressure and volume of the air sent through the burning fuel.—*American Miller.*

The wages of the employes of the Pennsylvania Railroad, and of all the roads under its control, were increased 10 per cent. on the 1st of April. This advance restores the figures prevailing before the riots of 1877.

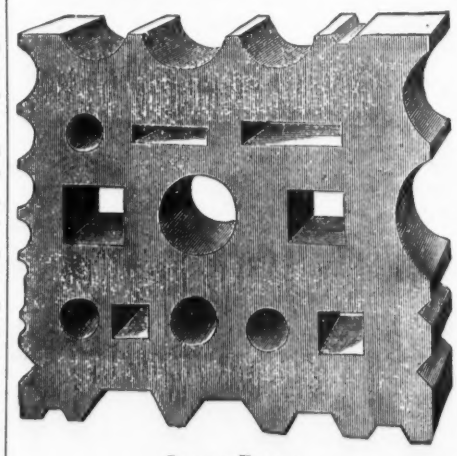


Brass Coating for Metal Goods.

Herr J. J. Hess, of Vienna, claims to have developed a good method for coating metal goods with brass. He prepares his solution in the following way: Dissolve 84 parts, by weight, of bicarbonate of soda, 54 parts of chloride of ammonia, and 13 parts of cyanide of potassium in 2000 parts, by weight, of water. Then cover the sides of the vessel containing the bath with sheet brass, cast, not rolled, and suspend a sheet in the bath, the former acting as anode and the latter as cathode. After allowing the current to pass through for an hour, the bath will be prepared for any object to be coated with the same alloy.

Utilizing Waste Rubber.

A process lately patented in Germany for utilizing waste rubber, of which many hundred tons are yearly thrown away as useless, is described as follows: The rubber waste is subjected to distillation in an iron vessel over a free fire, with the aid of superheated steam. The lighter oils which come over first are separated from the heavier products. The latter, when thickened and vulcanized in the usual manner, are found to possess all the good qualities of fresh rubber.



Swage Block.

The capital stock ($50,000) is being subscribed for a new jute mill to be built in New Orleans. Bagging, for cotton bales, is to be manufactured. A strong effort is being made to introduce the culture of jute into Louisiana, experience having shown it to be a more profitable crop than cotton, or other agricultural products.

The wages of the employes of the Baltimore & Ohio Railroad were advanced April 1st to the rates paid in 1877.

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☞ *We are not engaged in procuring patent rights, or in selling machinery; nor have we any pet scheme to advance, or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers, inventors, draughtsmen, and all those specially interested in the occupations we represent, on subjects pertaining to machinery.*

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CONTENTS.

	PAGE.
The Allen Governor	1
Extracts from Chordal's Letters	1
Foot Power Forming Machine and Attachments	2
Bits of Experience.—No. IV.—Prof. John E. Sweet	3
Getting the Right Start.—F. F. Hemenway	3
Complete Organization of the American Society of Mechanical Engineers	4
Rules of the American Society of Mechanical Engineers	5
Letters from Practical Men	5
R. Hoe & Co.'s Horizontal Hydraulic Press	6
Boiler Proportion and Construction. — Gauge Cocks, Water Gauges, Safety Valves, and Stop Valves.—W. H. Hoffman	6
Practical Blacksmithing.—Blast Pipes and Tools.—Frederick Lewis	6
Horse Power of Steam Boilers	7
Brass Coating for Metal Goods	7
Utilizing Waste Rubber	7
A Sound National Mechanical Engineers Society	8
Worthless Patents	8
Illuminated Workmen	8
Considerate Treatment of Apprentices	8
Questions and Answers	9
Literary Notes	9
Manufactures	9
Machinists' and Engineers' Supplies	10
Iron Review	10
Metal Review	10

A Sound National Mechanical Engineers Society.

We devote considerable space this week to the meeting for complete organization of the American Society of Mechanical Engineers, which passed off very pleasantly and satisfactorily. The rules reported by the Committee on Organization were freely discussed, but no radical change was proposed by any one present. They were adopted without substantial alteration, and are believed to be as well framed as those of any other society of the kind. The officers elected are men of well-known ability, and excellent professional standing, and will at once give strength and character to the organization.

The liberal tender of the hall of the Stevens Institute for the meeting will not soon be forgotten, nor will the bounteous hospitality of President Morton, who handsomely entertained the gentlemen present at his private residence.

The Council is expected to hold a meeting at an early date, choose a Secretary, and name the time and place for the next meeting, which will be for the reading and discussion of papers.

Now that this important society is successfully started it is proper to call attention to its conception and original projection. The idea originated with Prof. John E. Sweet of Syracuse, who, after interesting several other prominent engineers in the project, issued the call for the preliminary meeting which was responded to with enthusiasm as our readers already know. He has given much time and effort to secure a thorough and valuable organization at the outset. As Professor Sweet has modestly declined to accept a nomination for office, we heartily join in what appears to be the general desire of those taking part in the first meetings for organization, that the Council invite him to read the first paper before the Society.

Worthless Patents.

The amount of time and money expended by enthusiastic inventors, in inventing and patenting something that has already been invented by somebody else, is prodigious. The United States Patent Office is rather too confidently relied upon by numerous ingenious individuals who expect the securing of a duly sealed and recorded patent right entitling them, beyond peradventure, to the credit of originating the device upon which the claims thereby allowed them are based. This reliance often costs years of valuable time and the frittering away of thousands of hard earned dollars. The Patent Office, like other institutions of public and private life, is not infallible. It would be well for every inventor to bear this in mind before making his application for a patent.

Not infrequently some long pending patent litigation is effectually settled by the discovery that the device in dispute had been published or used in some foreign country long before its supposed inventor was born. This discovery, of course, must put an end to the claims of the latter as originating the device. We are not well informed as to the average amount of time expended in research by official patent examiners, before deciding to recognize or reject doubtful claims, but have confidence in asserting that searches that are most thorough and convincing are those prosecuted by intelligent inventors themselves where sufficient records of old inventions are within their reach. Public servants can not be expected to prosecute investigations as to originality with the same zeal as the man whose particular interest is at stake. Not infrequently a survey of rejected applications for English patents (and sometimes for American) gives the inventor a new light and dissuades him from further effort in the direction marked out.

There are scores and hundreds of contrivances upon which U. S. patents have been granted which may be found published in the English patent records, among allowed or rejected claims, dating back many years before their revival and appearance in our own records.

Our advice to inventors is, to search carefully the patent records of both our own country and Great Britain before spending much money upon a supposed original discovery. If the inventor has to travel a thousand miles to visit New York, Boston, Washington, or any other city where an extensive library of American and foreign patents is accessible, it is better to do so, than to take the chance of devoting months of time and the accumulation of years in the vain attempt to develop some contrivance exploded many generations ago.

The Astor library of this city, free to all, contains a most complete collection of patent records of all inventive countries. The Boston public library, also open to every comer, is well favored with patent records, and the Government patent office at Washington is a treasury of information for the groping genius who believes he has devised something entirely original, that "fills a want long felt."

Illuminated Workmen.

The recent trial of "luminous paint," as applied to the interior of railway cars in Great Britain, though only partially successful as an illuminating agency, would appear to present grounds for further investigation. While this process or compound may not afford light enough to enable passengers to read newspapers by, it is not to be wholly condemned upon this account, as it is well known that the lamps now in use on American railroads not only do not accomplish this result, but the managers do not intend or desire them to do so. If they give light enough at night, or in passing through tunnels, to prevent passengers from sitting in each other's laps, or picking each other's pockets, what public-spirited railway manager or censorious citizen can ask more?

But to proceed: It is well known that many foremen, and even proprietors, of machine shops, for example, are not to be readily distinguished, either by manner, appearance, or attainments from many of the men whom they govern or employ. Painting the outer garments of such persons with the preparation above described as luminous paint, notwithstanding it might be found insufficient to light the entire shop at night without the use of gas, oil, or electric apparatus, would certainly suffice to make them bright and shining examples to those about them, and might eventually be trusted to accomplish reformatory results of real value.

Even in those shops in which foremen and proprietors are beyond criticism in these respects, it would appear that good use of this preparation can be made upon the garments of many of the apprentices. The night apprentice or helper in a large establishment, for instance, who is sent upon an errand or set to do certain work alone, were his garments luminously painted, would find his dilatory or frolicsome movements made manifest to the whole shop, and himself compelled to begin a course of well doing.

Further, those shop proprietors who choose, could, doubtless, by the use of luminous paint, combined with chemicals of various colors, be enabled to designate their workmen in a most suggestive manner, according to their various mechanical attainments. Thus, workmen of a certain grade might be painted a bright crimson or deep green color, as desired, and these colors could be varied at pleasure. A noble emulation to rise from the bottle-green to the sky-blue class, for example, could hardly fail to be roused, which would in time become a potent element. Even if no material improvement in character or conduct should result, many of those workmen who now think themselves the task-worn servants of a mercenary despotism, would at least begin to recognize the picturesque nature of life in the shops.

In our issue of Feb. 21, we noted with pleasure that the continued growth of the American Machinist had brought its regular circulation up to 10,000 copies weekly. We take equal pleasure in stating that our edition has now reached 11,000 copies weekly, so important an increase, in so short a time, being certainly a very gratifying fact to all concerned.

Next week we hope to be able to publish particulars of the *first indicator test*, yet made for the public information at Menlo Park, of the steam engine which Mr. Edison is using to supply power required in his system of electric lighting. This test is preliminary to an exhaustive test, which we purpose making when a sufficient number of lights are in working order. The test was made by four engineers of recognized ability. We have refrained from saying much hitherto upon this subject, because we wished to wait until something tangible could be described.

Inconsiderate Treatment of Apprentices.

When an apprentice enters a shop he is generally put to work at scraping grease, cleaning castings, or helping machinists. At the expiration of a few weeks, he is placed at a small lathe, and under the instruction of the apprentice who is about to leave the lathe for a more advanced position, the young man is taught how to turn bolts and other small work. After a few days' instruction he is able to help himself, and begins to show his ambition in first learning to do this work well, then to do it quickly.

When the necessary instructions have been given, and the regular routine of shop practice has been passed through, the apprentice is placed in a position to do general work.

If the boy on entering the shop should prove himself ambitious and appears willing to push forward there should be no obstacle placed in his way, but the foreman should offer him every encouragement possible. There are many foremen who do not like boys and never give them a kind word. Many a good boy has been prevented from rising to the high position, which he might have filled had the foreman given him a kind word now and then when he does a good piece of work. It would be a great benefit to every foreman to cultivate the acquaintance of his apprentices and carefully watch their onward progress, giving them good advice and instruction, as they advance. When a boy succeeds in accomplishing a difficult piece of work he should have due credit for his efforts. We have frequently noticed the apprentice when presenting his work to the foreman for inspection and acceptance, after hearing the approving words of a generous foreman, in an expression something like the following: "Young man, that is a good job;" the warm blood rushes from the boy's heart to his face in a blush of hearty appreciation of those sentiments. How different from another case where the boy stands in suspense while the foreman carelessly inspects the piece of work, and gruffly says; "I guess that will do. Now I want you to get on to that other job, right away."

The boy feels wounded, and instead of going nimbly about his work, goes back to his machine wishing that he was out of the shop. When a boy goes into a shop, his heart is full of warm and sincere feelings, which he expects to find reciprocated by his employers. Boys should be encouraged and given proper credit for their work, and the result will be that the employers will get more and better work. The apprentices will become honored and better mechanics. When the men in other shops go out on a strike, those men and boys will consider their employers' interests before committing any such rash acts.

The employers and employes must be in sympathy with each other, in order to enable each to reap the greatest benefits.

A large portion of our reading columns this week is occupied by the particulars of organizing the American Society of Mechanical Engineers, and we have no hesitation in asserting that no subject is more worthy of the space. This society promises to be of estimable value to the mechanical interests of the country, as well as a great source of improvement to its members.

LITERARY NOTES.

THURSTON'S HISTORY OF THE STEAM ENGINE.

[Translated from Le Technologist.]

The History of the Steam Engine,* by R. H. Thurston, Professor of Mechanical Engineering at the Stevens Institute of Technology, has just been translated by M. Hirsh, Professor of Steam Engineering at the "Ecole des Ponts N. Chaussées, of Paris.

The two volumes of this work contain not less than 140 figures and 16 plates.

Mr. Thurston begins with the idea that great inventions are never the work of any one man, but are the result of the accumulated labor of a large number of investigators.

He distinguishes five periods in the history of the steam engine and two periods of speculation, which include the attempts of Hero of Alexandria, of Solomon de Cans, and in modern times those of the Marquis of Worcester, of Papin, and of Savery; then follow three periods of application as he calls the times of Newcomen, of Watt, and lastly the modern period.

Newcomen constructed the first steam engine industrially employed. The first locomotive was, as it is stated, the Rocket ‡ which came out at the competition at Liverpool in 1829. The first steamboats worthy of the name were tried on the great American rivers, and steam navigation had an immense and general application in the United States while only an experiment in Europe.

Since 1850, has been for the steam engine—provided as it then had become, with all its principal details, a period of refinement—a period of improvement rather than of invention. Thus, in the United States, the system of expansion, known as the Corliss arose.

The author does not attribute excessive importance to this, and anticipates that the steam engine of the future will have a "positive motion" valve-gear.

The work of Prof. Thurston is peculiarly rich in details unknown in Europe. We find here the earliest steam boilers of Fitch and Voight which was set up in 1787 in the steamboat of Fitch; this is the same year in which the experiments of Miller Taylor, and Symmington were made. The Comet of 1812, the Clermont of 1807, and the Fulton of 1814, are described—all well considered attempts; then come the North America and the Albany, already remarkable as realizing the type still in use on American rivers.

The work exhibits in a clear light the labors of the Stevens, who were among the most active pioneers in the revolution which has lately been completed in constructing the steam war vessels of modern times.

The work concludes with a statement of the mechanical theory of heat and its application to the steam engine.

*History of the Growth of the Steam Engine. By R. H. Thurston, A. M., C. E., Professor of Mechanical Engineering, etc., etc. [International Scientific Series.] Appletons', New York.

†Histoire de la Machine à Vapeur par R. H. Thurston, Prof. de Mecháique à l'Institut Polytechnique Stevens à Hoboken, Pres., New York. Revue Annotée et Augmentée par J. Hirsch, Prof. de Machines á Vapeur etc., etc., Paris, 1880.

‡The first to become industrially successful. — TRANS.

The Sugar Beet is the name of an interesting new quarterly illustrated journal, published by Henry Carey Baird & Co., Philadelphia, Pa. It is edited by Dr. Robert Grimshaw and Lewis S. Ware. Its aim is to introduce into the northern portion of America those sugar beet industries which have flourished so well in France, Germany and other European countries. The first number gives the following reasons why the beet-sugar industries have not been introduced into the United States:

1. Information in the English language upon the subject has been wanting.
2. On account of a prevailing prejudice that it is practically impossible, owing to its having been several times improperly attempted, and in such cases proving a failure.
3. Attempts at American cultivation have been made by those having but a limited knowledge of the subject.
4. The seeds that have been used have not been of the best variety, and were not planted according to improved principles long since known in Europe.
5. On account of an opposing and interested prevailing element represented by owners of Southern sugar plantations.
6. Unfounded fears of certain protectionists that the yearly government revenues would be diminished.
7. Undertaking the manufacture without expert advice and with insufficient capital.
8. So many have waited for others to commence.

The subscription price of the *Sugar Beet* is only 50 cents a year.

THE FIELD ENGINEER, A Handy Book of Practice in the survey, location and track-work of railroads; containing a large collection of rules and tables applicable to both the standard and the narrow gauge. For the young engineer. By William Findlay Shunk, C. E. 320 pages; tucks for the pocket. Price, $2.50. D. Van Nostrand. New York.

The first thing that a young engineer requires after graduating from college is practical knowledge. The author of this book is a practical engineer of extensive experience.

He commences the work by announcing that his principal aim in preparing this book has been to serve that class of young engineers who, like himself, have not had the benefits of a technical education before entering the field for a livelihood.

The earlier chapters are devoted to the exposition of mathematical truths and methods, with which the young Engineer must become familiar at the outset, as well as their practical application.

The chapters following are devoted to the selection, care and management of the necessary instruments. Numerous hints are given in regard to field routine, which will doubtless be appreciated by the inexperienced learner.

The problems and instructions in reference to staking out work are very valuable, as they are taken from actual practice, likewise the articles on field location, with practical instructions.

The tables contained in this book are very plain and of such a form as to be readily used for reference. These tables consist of radii and their logarithms, squares, cubes, square roots, and cube roots, reciprocals of numbers, logarithms of numbers, logarithmic sines, cosines, tangents and cotangents; also other tables and problems relating to the laying out of curves, slopes and grades.

The Jeweler's Journal, a sixteen page monthly, devoted to the interests of watch makers, jewelers, engravers, &c., is now in the fifth number of Vol. I. It is a newsy, interesting publication, appears to be well appreciated, and deserves it. Subscription price, $1.50 per annum. It is published at 103 State Street, Chicago, Ill.

BRAIN AND MIND, or Mental Science Considered in Accordance with the Principles of Phrenology, and in relation to Modern Physiology. By Henry S. Drayton, A. M., and James McNeill. Illustrated. 334 pages; price, $1.50. Published by S. R. Wells & Co., 737 Broadway, New York.

The literature of phrenology is extensive, far beyond the conception of those who have not given the subject a personal consideration, being spread through a hundred or more volumes of magazines, and represented otherwise by treatises on the whole, or different departments of the subject. The work of George Combe has been for many years a most complete one, and susceptible of few, if any changes, but many discoveries have been made which oblige us to consider the works referred to as old.

The authors of *Brain and Mind* went to work with a determination to prepare a treatise which would embody all the new discoveries, and be a treatise on the relations of the thinking principle to its physical instrument, and which would also contain the doctrines of phrenology, and show their connection with the latest modern physiological thought. The book is explicit and clear in its definitions, the application of its teachings to practice being constantly kept in view. Whether the reader believes in phrenology or not, he will find this volume a mine of interest, from which he may gather many suggestions which will give him clearer views of the nature of mind, and the responsibilities of human life. It is one of those books which is interesting to nearly every one.

Business Specials.

40 cts. a line for each insertion under this head.

Dixon's Traction Belt Grease. Dixon's Founders' Perfect Wash. Dixon's Plumbago Foundry Facing. Dixon's Graphite Machine Grease. Dixon's Everlasting Graphite Axle Grease. Dixon's Dry American Graphite Perfect Lubricator. Send for explanatory circular to Dixon Crucible Co., Jersey City, N. J.

Mechanical Engineering, thorough instruction, practical and theoretical. Richards & Dole, Springfield, Mass.

For Schaffer & Budenberg's celebrated Steam Pressure, Hydraulic and Vacuum Gauges, Engine Counters, Pyrometers, Thermometers, Reducing Valves, Superior Crysial Gauge Glasses, etc., address W. Heuermann, 40 John Street, New York.

American Watch Tool Co., Waltham, Mass., Whitcomb Watch Makers' Lathe, and Watch, Watch Case, and Clock making Machinery.

For bottom prices on Bras Castings, and Catalogue, address H. B. Morris, Ithaca, N. Y. Models and machinery to order,

See Standard Turbine advertisement in late number.

Wilkinson & Crowell, 1201 Beach St., Philadelphia, make an Improved Metallic Piston Rod Packing, which is entirely automatic and of great durability. Works well at high or low pressure, and can be used in common stuffing box, or without any stuffing box at all.

Norris & Rutter, Mechanical Draughtsmen and Patent Solicitors, 424 Walnut Street, Philadelphia.

A new automatic valve gear for steam engines complete. Address, Ed. F. Williams, P. O. Box 148, Leadville, Colorado.

Lathe Attachments for Milling Plane and Irregular Forms; Taps and Reamers fluted and Gears cut without removing from the lathe centers. For extended description, see AMERICAN MACHINIST, Sept. 13 and 20 issues. Send for circular to Wm. Main, 65 Henry Street, Brooklyn, N. Y.

James W. See, Consulting Engineer, Hamilton, Ohio.

Car Builders' Dictionary. Now ready. Assigns names to kinds and parts of railroad cars, identifying each. 800 engravings, and 490 pages. Price, postage prepaid, $2. Ten copies to one address, $17.50. Published by the *Railroad Gazette*, 73 Broadway, New York.

Engines Indicated—Power Measured. W. H. Odell, Box 274, Yonkers, N. Y.

Manual of Power for Machines, Shafts, and Belts, with the History of Cotton Manufacture in the United States, by Samuel Webber, C. E., copyrighted 1879. Only work of the kind extant; 240 pages. Price $3. Address, D. Appleton & Co, New York, or the author, Manchester, N. H.

Sheet Metal Presses. Ferracute Co., Bridgeton, N.J.

A saving of over 100 per cent. in fuel.—The new Pulsometer Steam Pump; Satisfaction guaranteed; send for descriptive pamphlet and prices. Pulsometer Steam Pump Company, sole manufacturers, 40 John st., N.Y.

To Manufacturers and others: We are prepared to build all kinds of machinery. Patent Articles a Specialty. Correspondence Invited. Mather & Newitt, Practical Machinists, Leominster, Mass.

John Fish, M. E. Air Compressors and Working Drawings a specialty. Room 23, 10 Pine St., New York.

Sheet Metal Drop Presses. Stiles & Parker Press Co., Middletown, Conn.

W. Barnet Le Van, Mechanical and Consulting Engineer, 3607 Baring Street, Philadelphia, Pa.

Questions and Answers.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly and according to common sense methods.

(1) W. E. N., Helena, Montana, asks: Will you answer through your paper the following question? What was the largest locomotive ever built in the United States, also the size of its drivers, and was it a success? *A.*—The largest locomotive ever built, to the best of our knowledge, was the "*Uncle Dick*," which was built last year by the Baldwin Locomotive Works of Philadelphia, for the Atchison, Topeka and Santa Fe R. R. The principa, dimensions are as follows: Cylinders, 20" diam.; 26" stroke; total wheel base, 22'; 10" diameter of boiler inside; 57" length of fire box, inside, 119"; width of fire box inside, 33½"; capacity of saddle water tank attached to boiler, 1,200 gallons; weight on driving wheels, 100,000 lbs; weight of engine in working order, including fire and water in tank, 115,000 lbs.; diam. of driving wheels, 42"; rigid wheel base (between rear and 2d pairs of drivers) 9 feet.; number of tubes, 213; diam. of tubes, 2"; length of tubes, 10' 11¾"; heating surface in fire box, 153 square feet; heating surface in flues, 1,223.84 square feet.; total heating surface, 1,376.84 square feet. This engine was built for very heavy grades, and has hauled nine loaded cars, carrying twelve tons on each car over a grade of 316 feet to the mile, and 16° curve. It would probably have hauled ten cars if required. The *Uncle Dick* is regarded as an entire success.

(2) T. W. H., Owen Sound, writes. Our engine is a condensing, vertical, propeller engine, 30" diameter, 34" stroke of piston, 55 lbs. pressure. In connecting the necessary pipes to either end of the cylinder will ½" pipe be fully large enough to supply a Richards' Indicator? There will only be about 48" of ½" pipe with only one elbow, the other portion of the pipe to the ends of the cylinder being 1". The communication to the cylinder is about opposite the ports on the top and bottom of cylinder. Is that the best place to connect the pipes? And will ½" pipe give the indicator every chance? By answering those questions in your next (as we are busy fitting out) you will much oblige. *A.*—In applying an indicator to the cylinder the connections should be as short and straight as possible. We would recommend that you tap the cylinder on the side, if possible, and not opposite the ports, for obvious reasons. Some engineers claim that there is no difference in the results, whether the indicator is attached to the center of two pipes leading to each end of the cylinder, or attached to each end of the cylinder itself. It is a well known fact that there is an increase of friction, and consequently a loss by passing steam through small pipes and elbows, hence the reasons for the foregoing directions. A short ½" pipe is amply large enough.

(3) D. D., Chicago, Ill., writes: 1. What size of cylinders would it require for a double acting engine making from 25 to 30 strokes a minute to equal 18 horse power with 45 lbs. of steam? *A.*—We suppose the engineer means 25 or 30 revolutions per minute, as 30 *strokes* per minute gives but 15 *revolutions*. We therefore assume 30 revolutions as his speed. A double cylinder engine to develop 18 horse power with 45 lbs. boiler pressure, engine fitted with plain slide valve, whose outside lap is equal to width of port inside lap, 1-32", would require the steam cylinders each to be 11" diameter with a piston stroke of 20". If a cut-off valve was used, to follow, say, one-fourth of the stroke, the cylinders would then be 14" diameter and 24" stroke. The piston speed in the first instance would be but 99 6-10 feet per minute, and in the second case 120 feet per minute, a speed *altogether* too low for anything like economy. It should not be less than 400. The initial pressure in cylinder would not be over 40 lbs., probably 38 lbs. per square inch, if a throttle governor was used. 2. What would be the size of boiler required to drive those cylinders using 45 lbs. pressure, and what would be the required number of flues for such boiler? *A.*—The boiler for these engines, if horizontal tubular, which is the best for durability, should be 38" diameter, and 10 feet long, with thirty-six (36) 2½" tubes, located in shell, as per articles on Boiler Proportion and Construction, by Mr. W. H. Hoffman, published in the AMERICAN MACHINIST since September, 1879. If anthracite coal is used there must be 8 square feet of grate, and for soft coal, 9½ square ft. Flue to chimney should be 14" in diameter. 3. What is the steepest grade that a locomotive engine can ascend? *A.*—For actual work done without a rack rail see answer to a previous question in this issue. With a rack rail an engine may be so constructed as to climb a perpendicular. 4 How do they keep the flues covered on those engines which are used to ascend some of the grades in Colorado? A gear is used on these engines—gearing with a rack—to propel them. *A.*—Where plain rails are used without a rack, the flues are placed rather low, and the crown sheet of the fire-box slopes from the front end toward the back end. This prevents the parts in contact with the fire from being uncovered in ascending or descending heavy grades. Where a rack rail is used, and the grade is very nearly constant, the boiler is generally inclined at an angle with the frame, so as to bring it level when the engine is running on an incline.

MANUFACTURES.

It is the intention of Whitall, Tatem & Co., of Millville, N. J., to make their glass factory the largest in the world.

A big steam whistle that can be heard ten miles has been placed on Weidmann's mill, at Paterson, N. J. The people who are awakened by it at 6.20 o'clock every morning are indignant.

A project is on foot for the establishment of a large woolen mill at Fort Worth, Texas.

The rolling mills of Chicago now employ over 3,000 men, and are running night and day.

A new blast furnace is to be built at Kyle Slope, Jackson county, O.

There are 46 rolling-mills in Ohio, 32 of which are in operation.

The Pacific Iron Works, San Francisco, Cal., have just started to build the Wheelock Steam Engine. Parties are now building this engine in Manchester, England, and Lisle, France.

The Wire Cloth Company at Clinton, Mass., are preparing to build a new mill 150 by 56 feet, for weaving, a new blacksmith shop, and an addition of 36 feet to the side of the present tower.

Kingsland, Ferguson & Co., St. Louis, expect to have their new foundry completed and put into operation within thirty days.

A large steel mill is to be erected at Youngstown, Ohio, by Cleveland capitalists.

The Waterbury Brass Company, Waterbury, Conn., are about to enlarge their works.

The Mason Machine Works at Taunton, Mass., are employing 650 men against 200 two years ago.

Extensive car-works are to be established in Marshall, Texas, shortly, backed by $1,000,000 of capital, under the title of Marshall Car and Foundry Company.

Quincy, Ill., contains among other manufacturing establishments, four large machine foundries, one governor works, four large stove foundries, two agricultural implement works, several plow shops, about a dozen wagon factories, and a number of furniture factories.

Joseph Peters is building an addition to his furniture factory in St. Louis. The new building is thirty-five feet front by one hunhundred and thirty feet deep, four stories and basement. Considerable new machinery will be placed, and work furnished for a number of additional men. The building will be ready for occupancy by May 1st.

The Phoenix Furniture Company, of Grand Rapids, Mich., has begun the erection of another large building in connection with their extensive factory. It will be of brick, five stories in height, 75x200 feet on the ground, and will cost about $40,000.

Machinists' and Engineers' Supplies.

New York, April 8, 1880.

It is intimated that the business boom is broken, but this rumor seems to be confined to the smaller dealers who have had all their capital invested in stock, and have been obliged to sell to meet their bills. The market is steady and business is good.

Some of the larger dealers in brass and iron pipe fittings, have called in their traveling agents, and solicit no new orders.

Iron pipe is a little weaker.

Taps and dies are stiffening and are very hard to obtain.

Bolts and nuts are in good demand, and the manufacturers are behind with their contracts.

Steel forged hammers are very scarce and dealers cannot readily fill their orders.

We have received from Messrs. Thompson, Sterne & Co.—The Crown Iron Works of Glasgow—a new illustration price list of emery wheels and grinding machinery. This little book is in pocket form and contains 59 pages, is neatly arranged, and fully illustrates the class of machinery manufactured by the above named company. They also have houses in London and Paris.

The E. Horton & Son Company, of Windsor Locks, Conn., has been re-organized by the appointment of Jabez H. Hayden, President, Ezra B. Bailey, Secretary and Treasurer, and Dwight Slate, Superintendent of the Mechanical Department. Mr. Slate is from Hartford and is a well known and skillful mechanic. The Company will continue to manufacture the "Horton Chuck," which has been made by them for many years. They expect to make an Independent Jaw Chuck in connection with it, and hope also to put a Combination Chuck upon the market in course of a few weeks.

Metal Review.

LUCIUS HART & CO., 8 & 10 Burling slip, New York, furnish us the following, under date of April 7, 1880:

Metal Market without material change since our last. Pig Tin, £87.10/ in London; $29½ in Singapore. Spot Market; Banca Tin, 24 c.; Malacca & Straits, 21½c.; Billiton, Australian and Refined, 20¾c. to 21¼c.; "Lamb & Flag," 20¾c. Pig Lead, 5¾c. to 6c. Antimony, 24½c. for Cookson. Other brands, 19c. to 20c. Spelter, 6⅝c. for either Domestic or Foreign. Ingot Copper, 22½c.; Nickel, $1.25.; No. 1 Solder, 12c.; "Half-and-half," 14c.

Iron Review.

New York, April 8, 1880.

There has been no change in the price of pig iron since our last. We quote nominally No. 1, $37 to $38, No. 2, $36 to $37, grey forge, $35 to $36. Scotch pig sells in small lots at the following prices: Eglinton $28, Glengarnock $28.50 to $29 and Coltness $31.50. There is a good demand for old rails at $38 to $38.50 a ton.

The general iron market continues in favor of buyers, and the following quotations are nominal, as quantities can be bought for less.

Pierson & Co., 24 Broadway, N. Y., under date of April 1st, 1880, quote prices out of store as follows:

Iron Rails, $68 to $70, according to weight; Fish Plates, 3½c. per lb.; Railway Spikes, 4½c.; Bolts and Nuts, 5c.; Common Bar Iron nominal, 3 5-10c., basis from store; Refined do., 4c., basis; Ulster, 5c., basis; Machinery Steel, 7c.; Best Tool Steel, 13½c.; Norway Bar Iron, 6¾c.; Norway Shapes, 6¾c.; Nail Rods, 7c.; Sheet Iron, 4¾c., basis; Angle Iron, 4 3-10c.; Tee Iron, 4 8-10c; Band Iron, 4 7-10c.; Hoop Iron, 4 8-10c., and up according to size; Horse Shoe Iron, 4½c.; Hot Polished Shafting in lengths, 2 ft. and longer, 9 to 10½c., according to size; Small Black Rivets, 30% off in papers, 10% off in bulk.

Carmichael & Emmens, 130 Cedar Street, New York, under date of April 1st, report Boiler-makers supplies: Flange, 6c.; C. H. No. 1 Shell, 5c., C. No. 1, 4¾c.; Sheets, 4¼c. basis; Boiler Tubes, 10 to 20% discount.

WANTED.

Two brothers, first-class general machinists and tool makers, want a job. West preferred. Address, stating work and wages, A. Ladd, 11 West Adam street, Syracuse, N. Y.

Wanted Foreman of a Machine Shop one accustomed to fitting hardware or light work, also Metal Pattern Maker familiar with the gating of small patterns. Apply to St. Louis Malleable Iron Co., St. Louis.

WANTED—A few strictly first-class machinists accustomed to tool building, capable of fitting up work in a thorough manner. Address Niles Tool Works, Hamilton, Ohio

Wanted 20 good Machinists and 10 good Moulders. H. B. Smith Machine Co., Smithville, Burlington Co., N. J.

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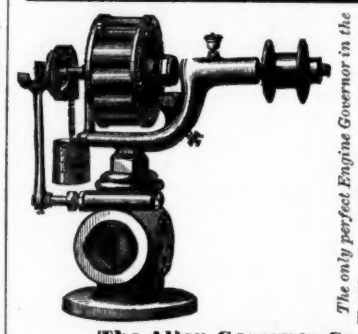

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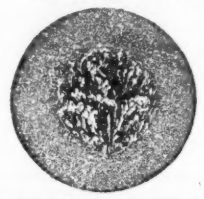

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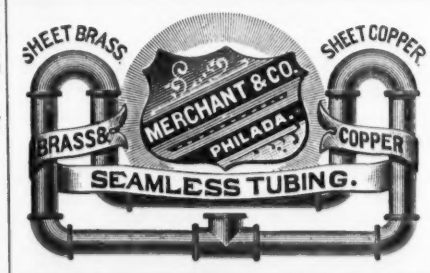

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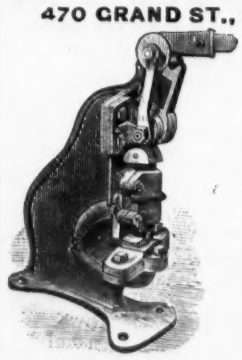

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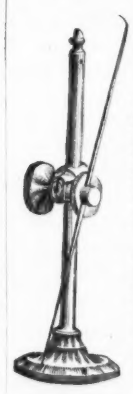

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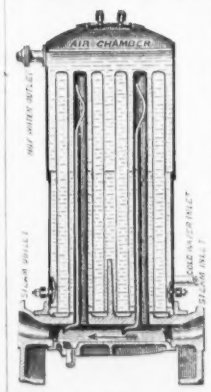

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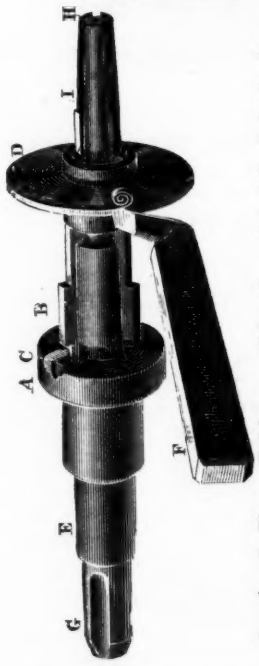

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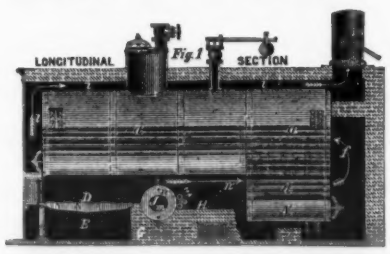

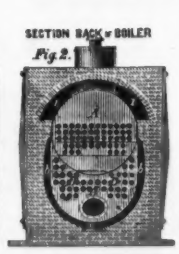

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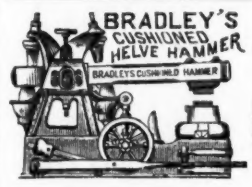

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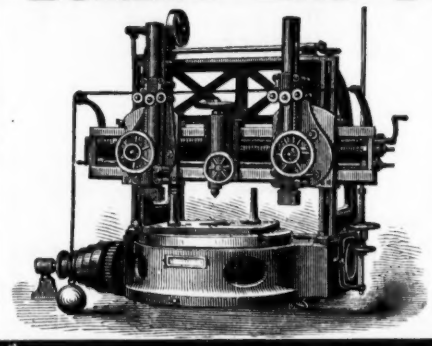

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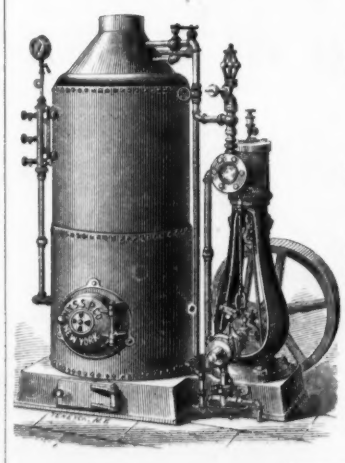

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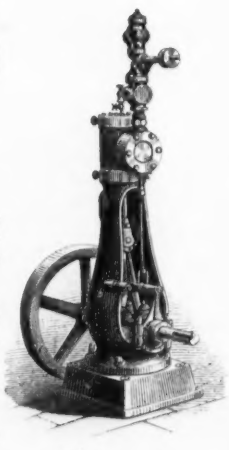

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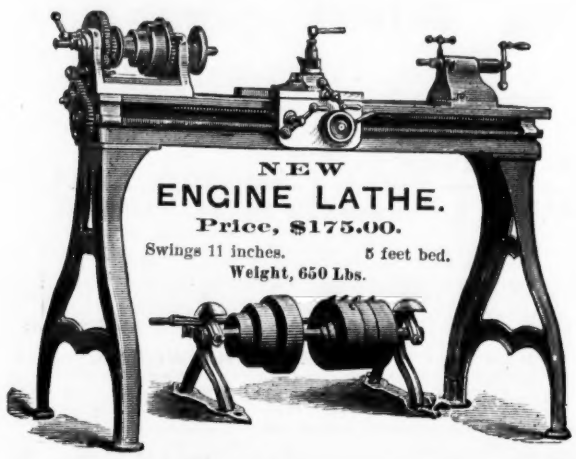

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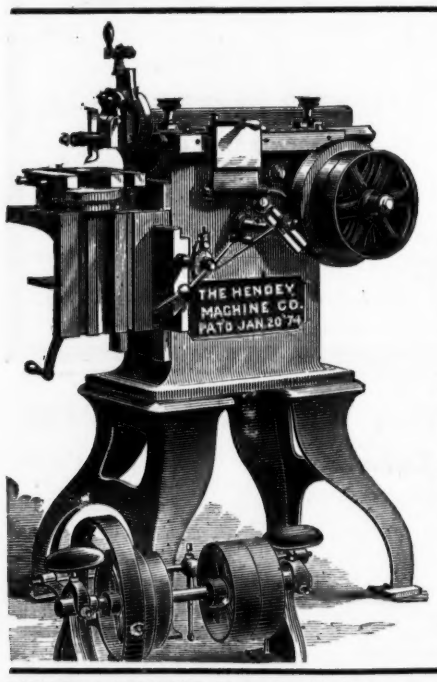

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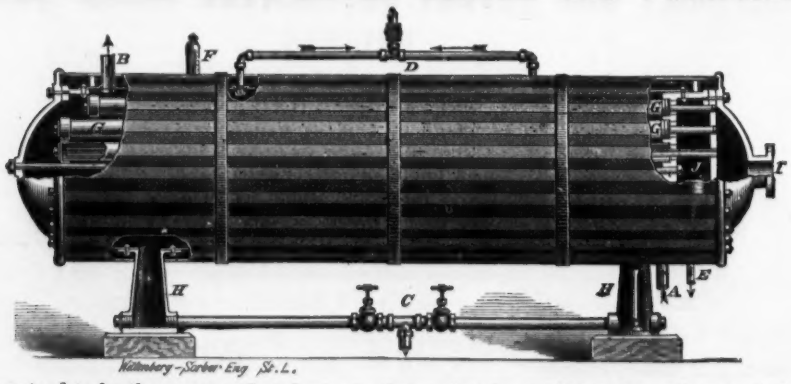

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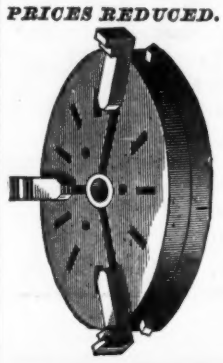

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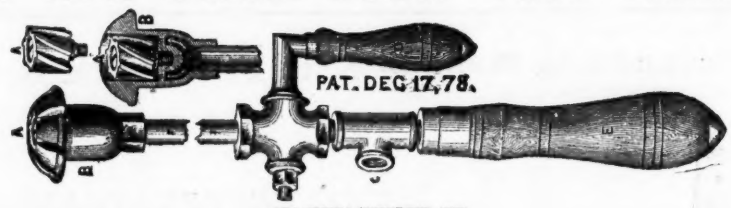

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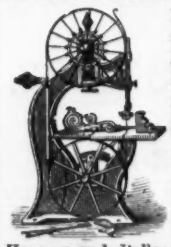

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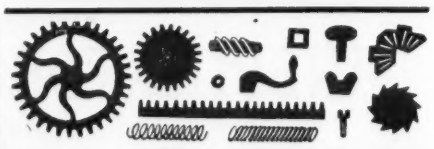

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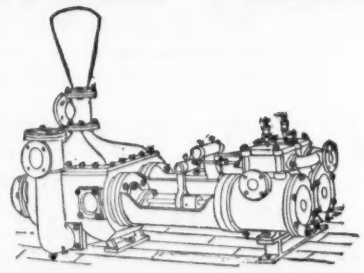

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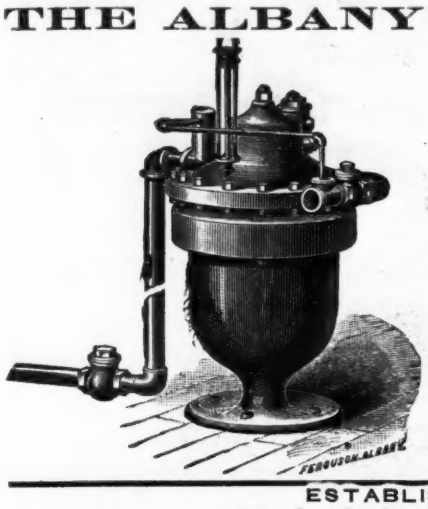

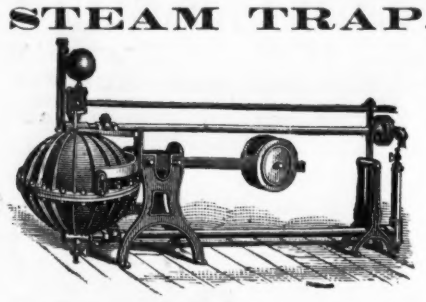

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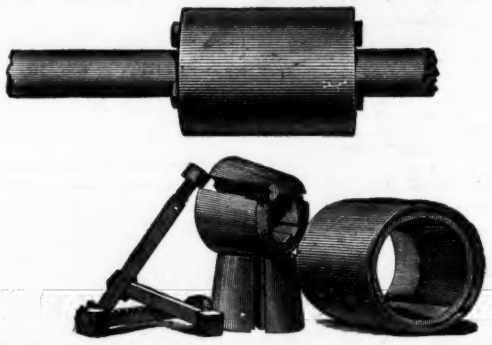

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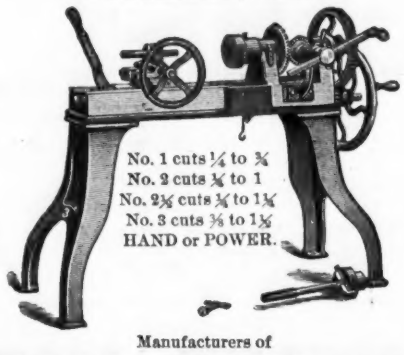

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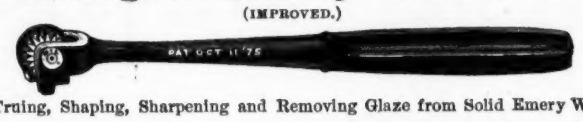

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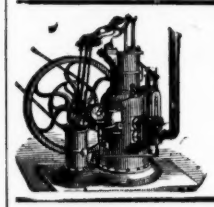

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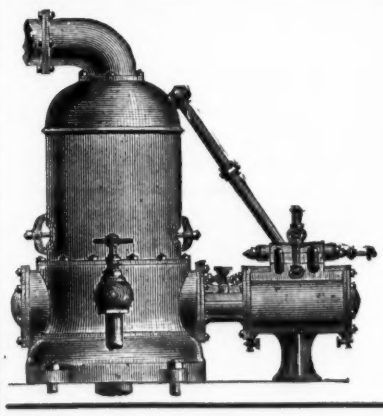

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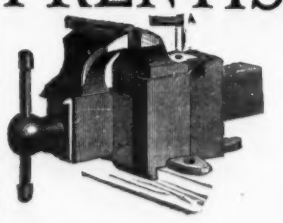

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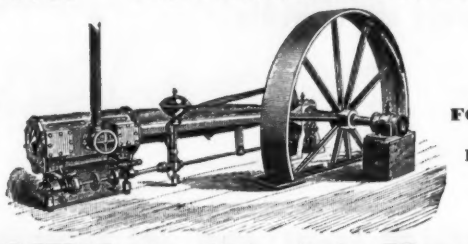

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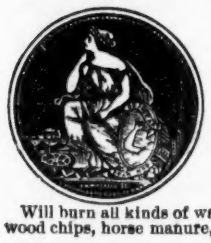

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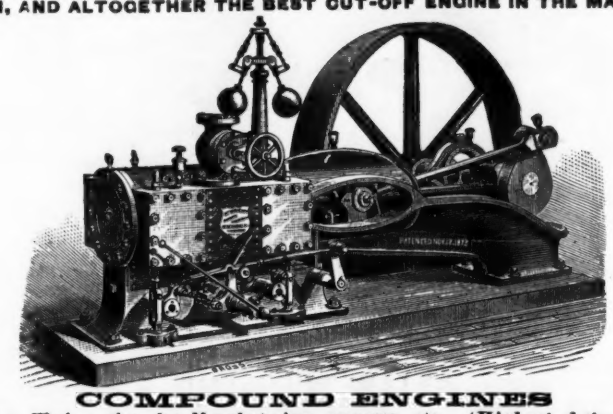

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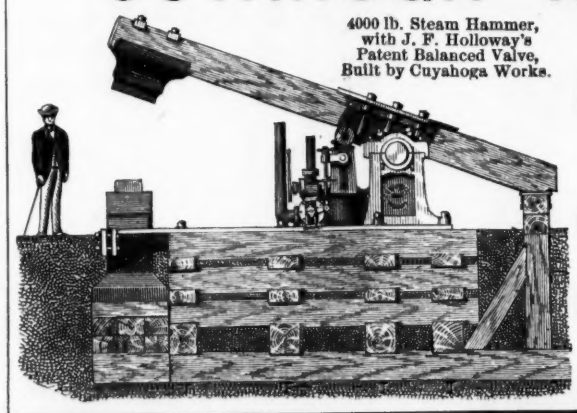

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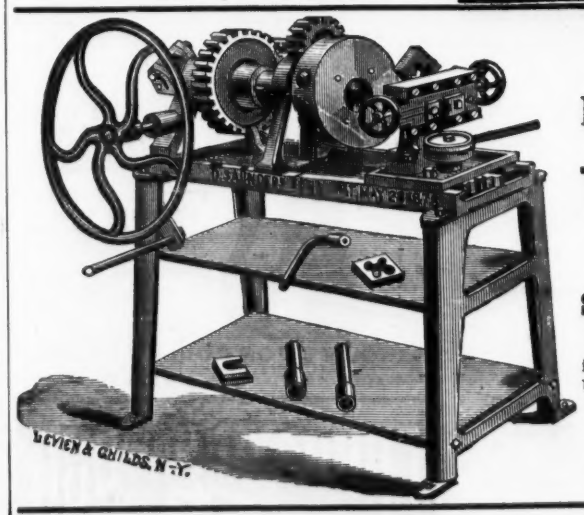

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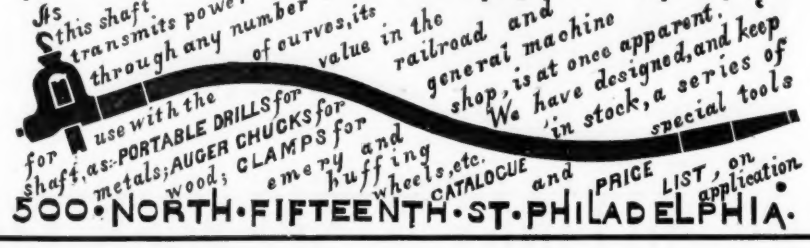
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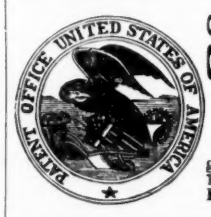

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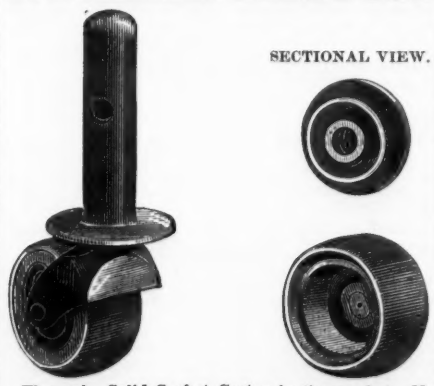

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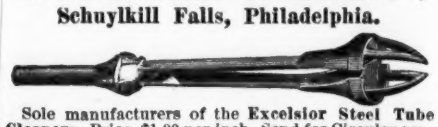

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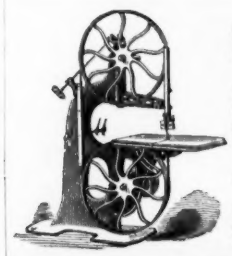

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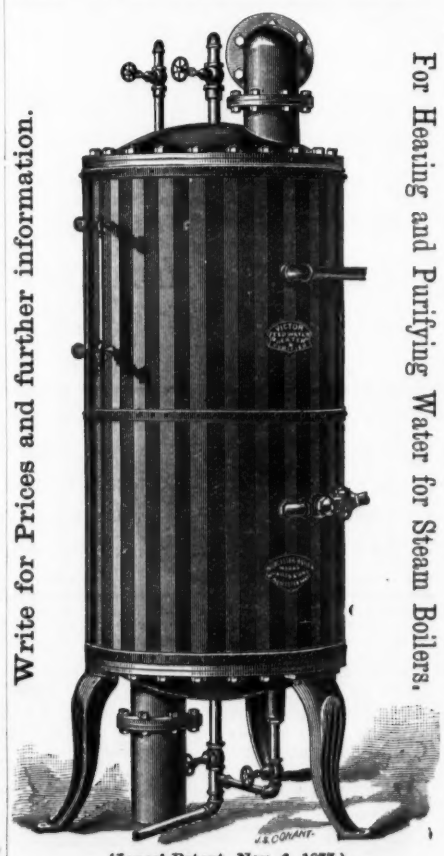

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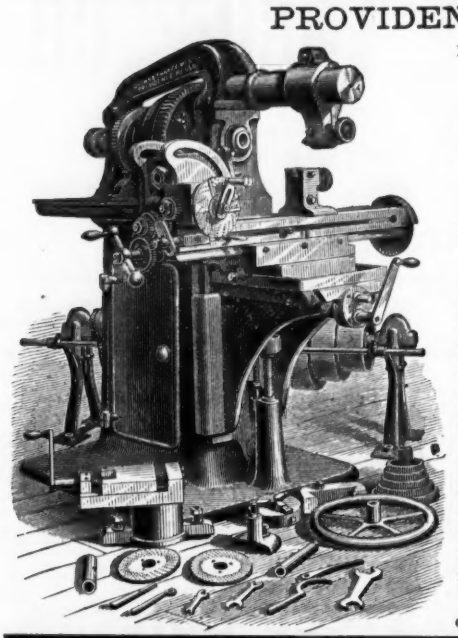

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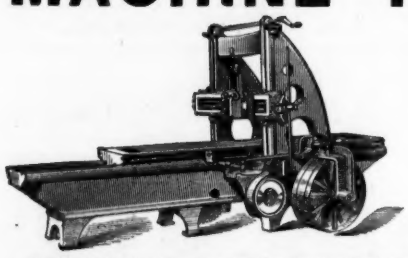

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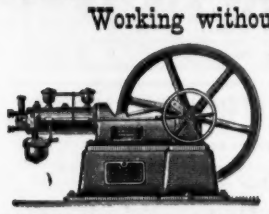

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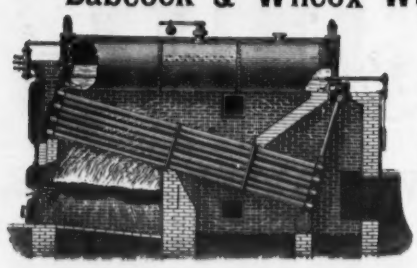

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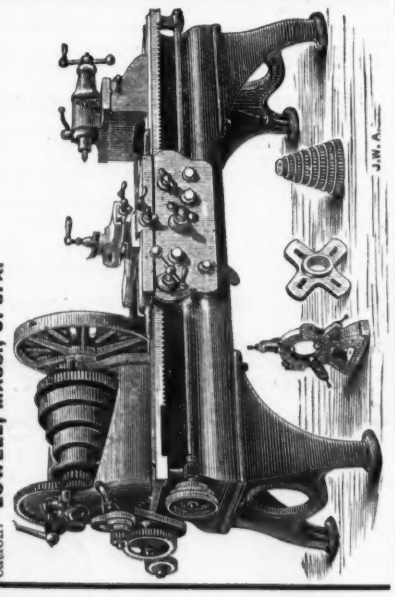

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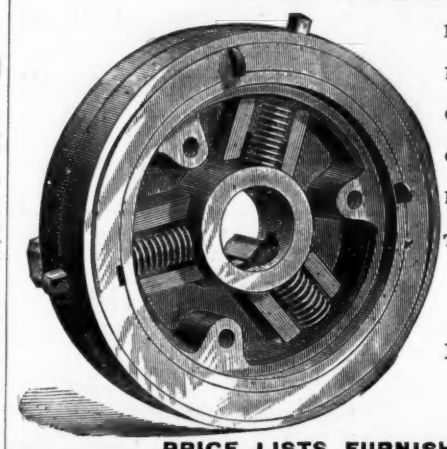

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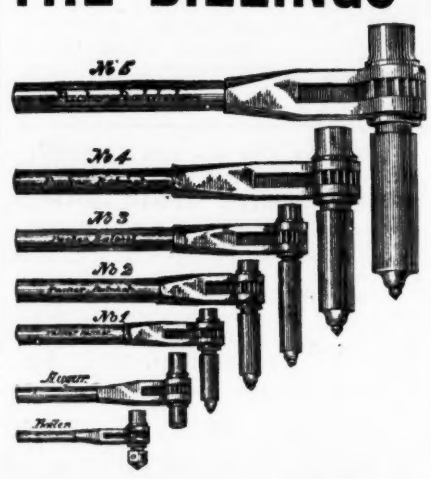

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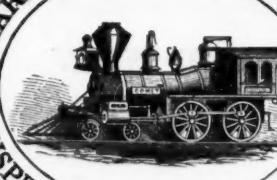

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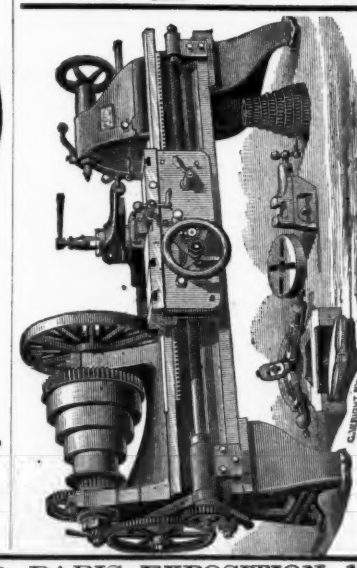

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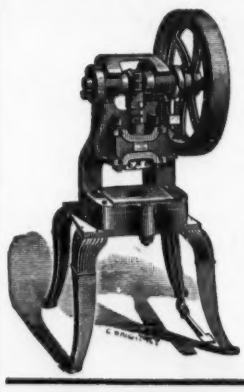

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